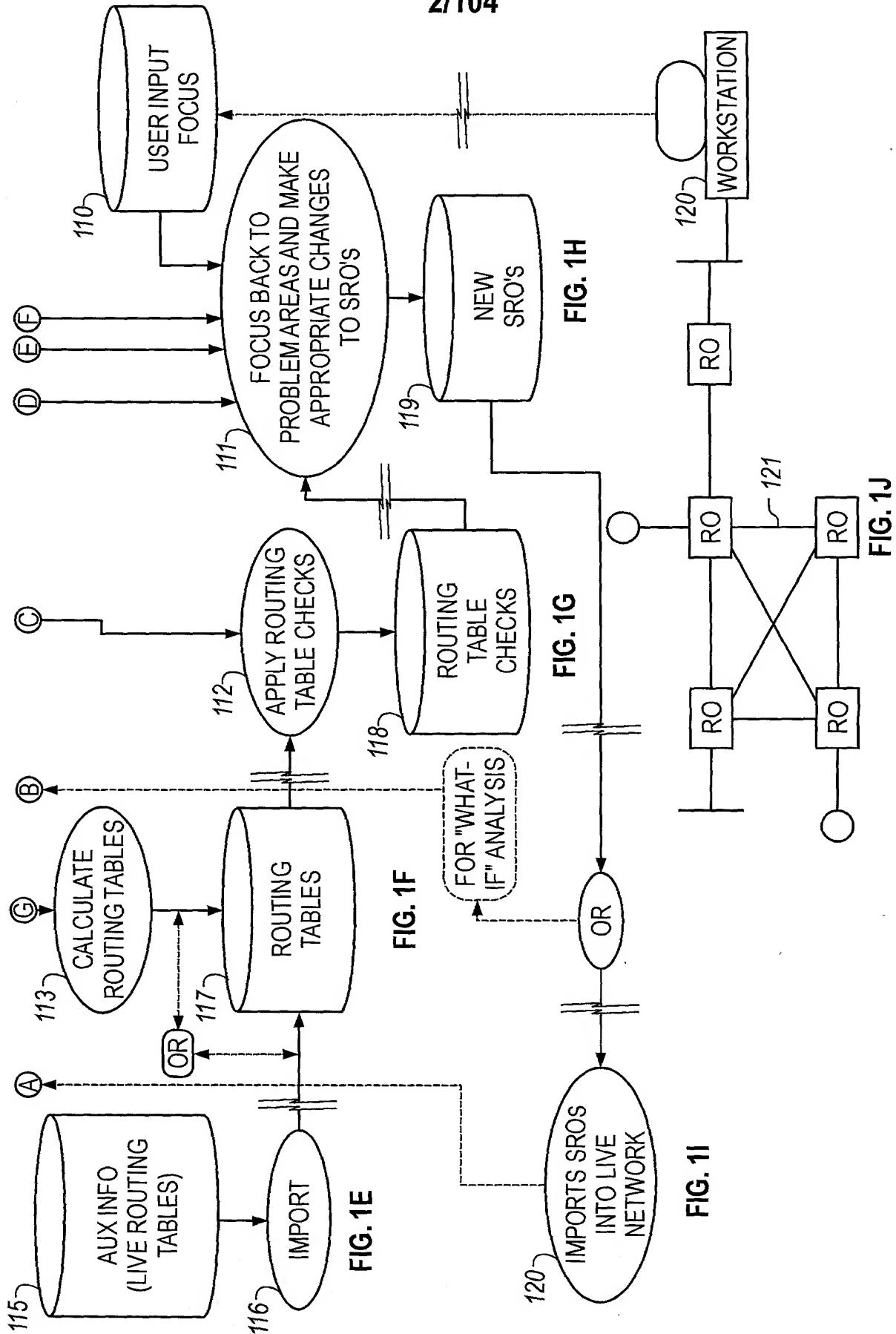


2/104



3/104

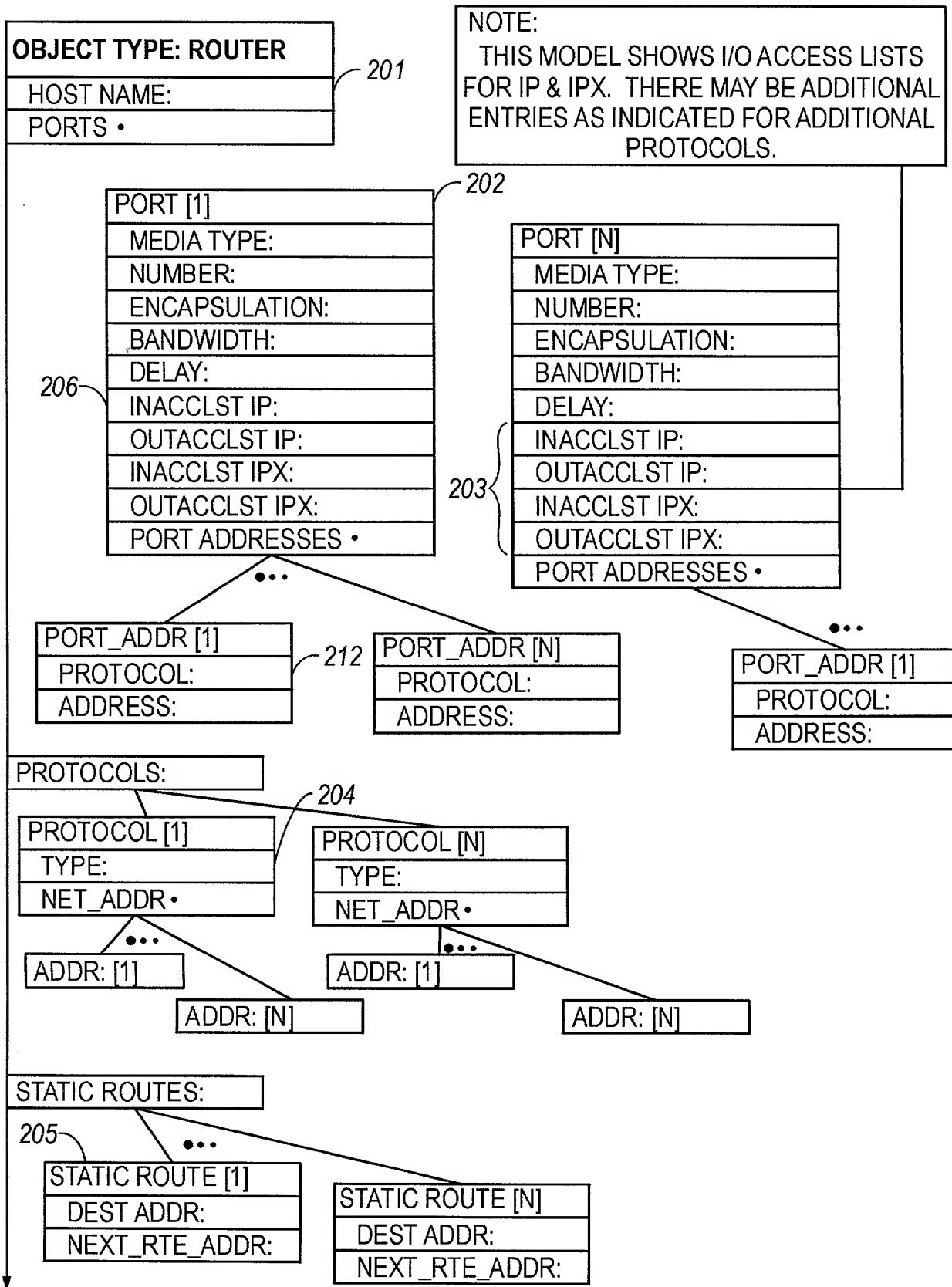


FIG. 2A

4/104

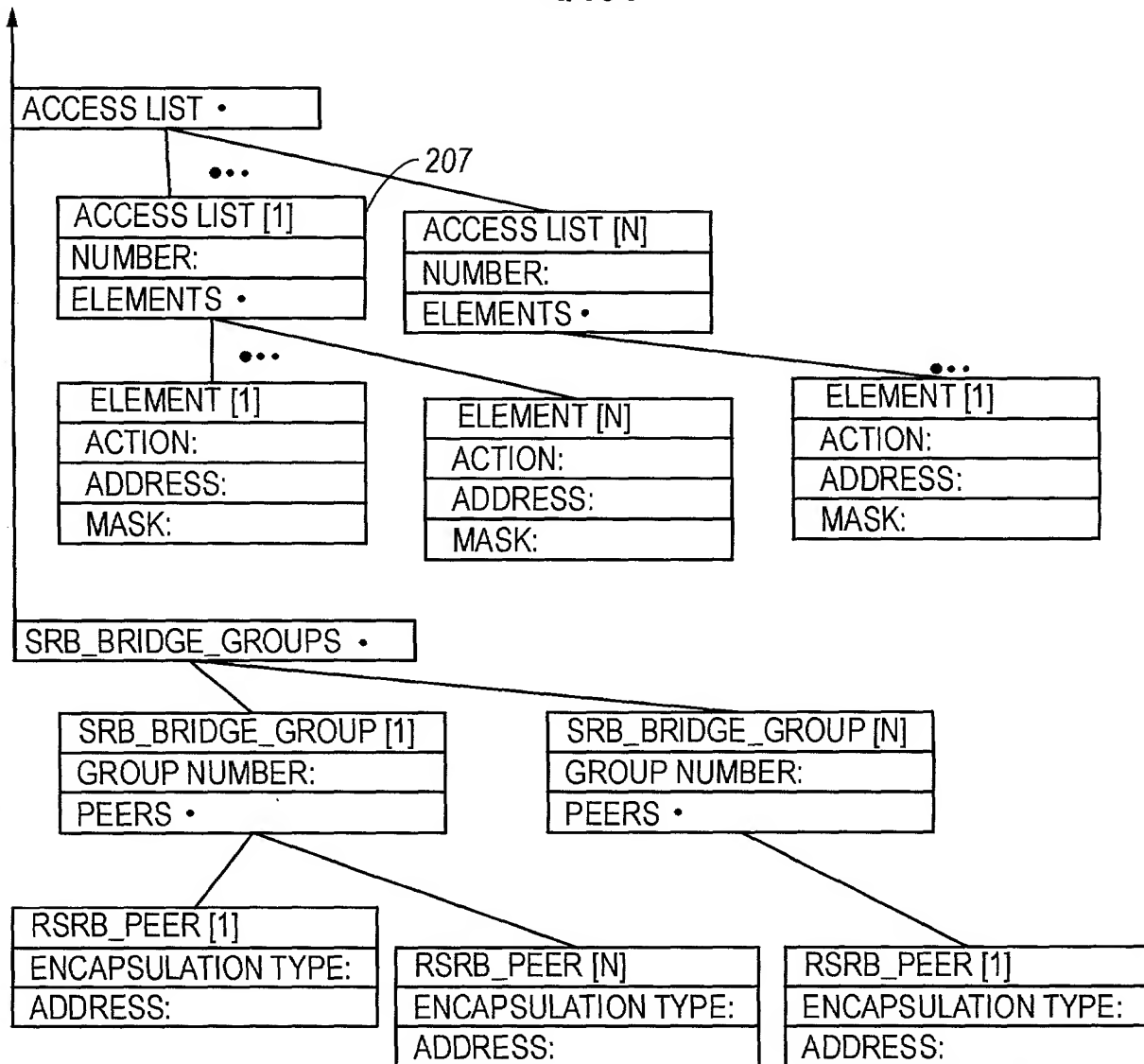


FIG. 2B

5/104

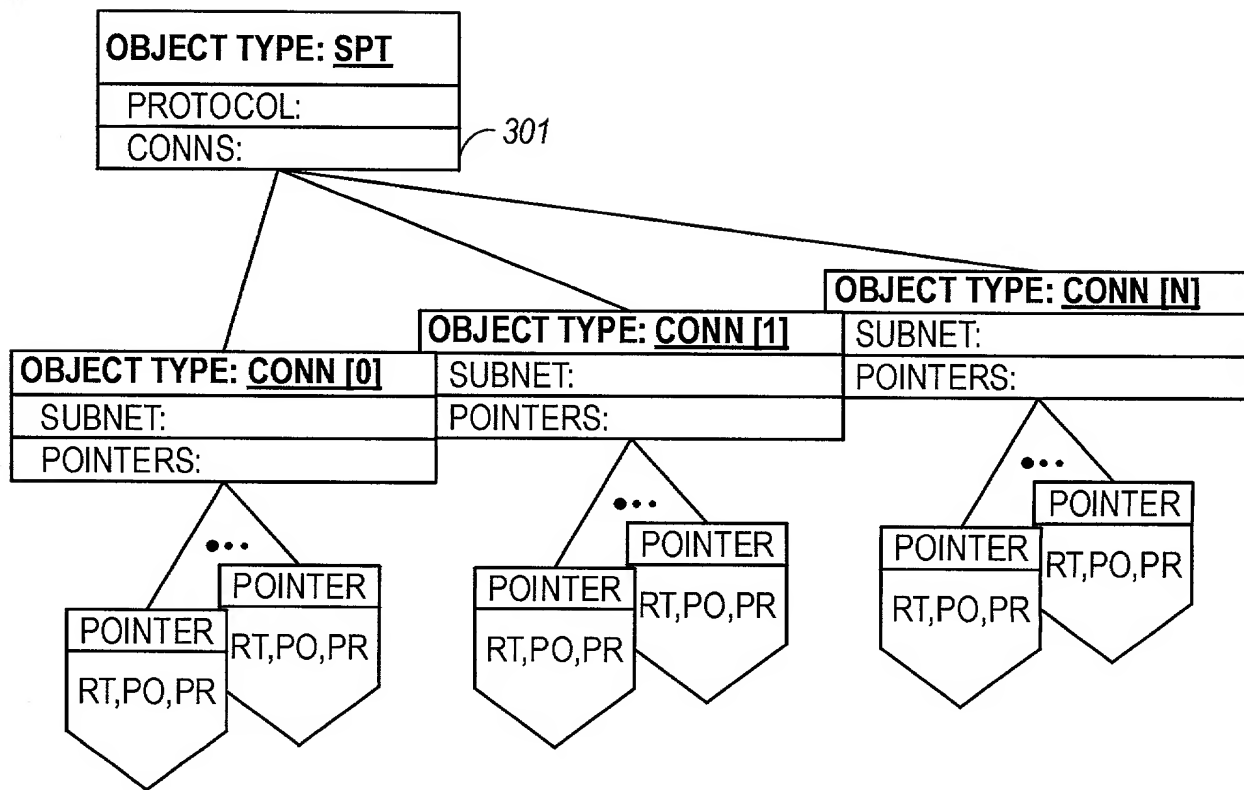


FIG. 3

NOTE:
 RT=ROUTER
 PO=PORT
 PR=PROTOCOL

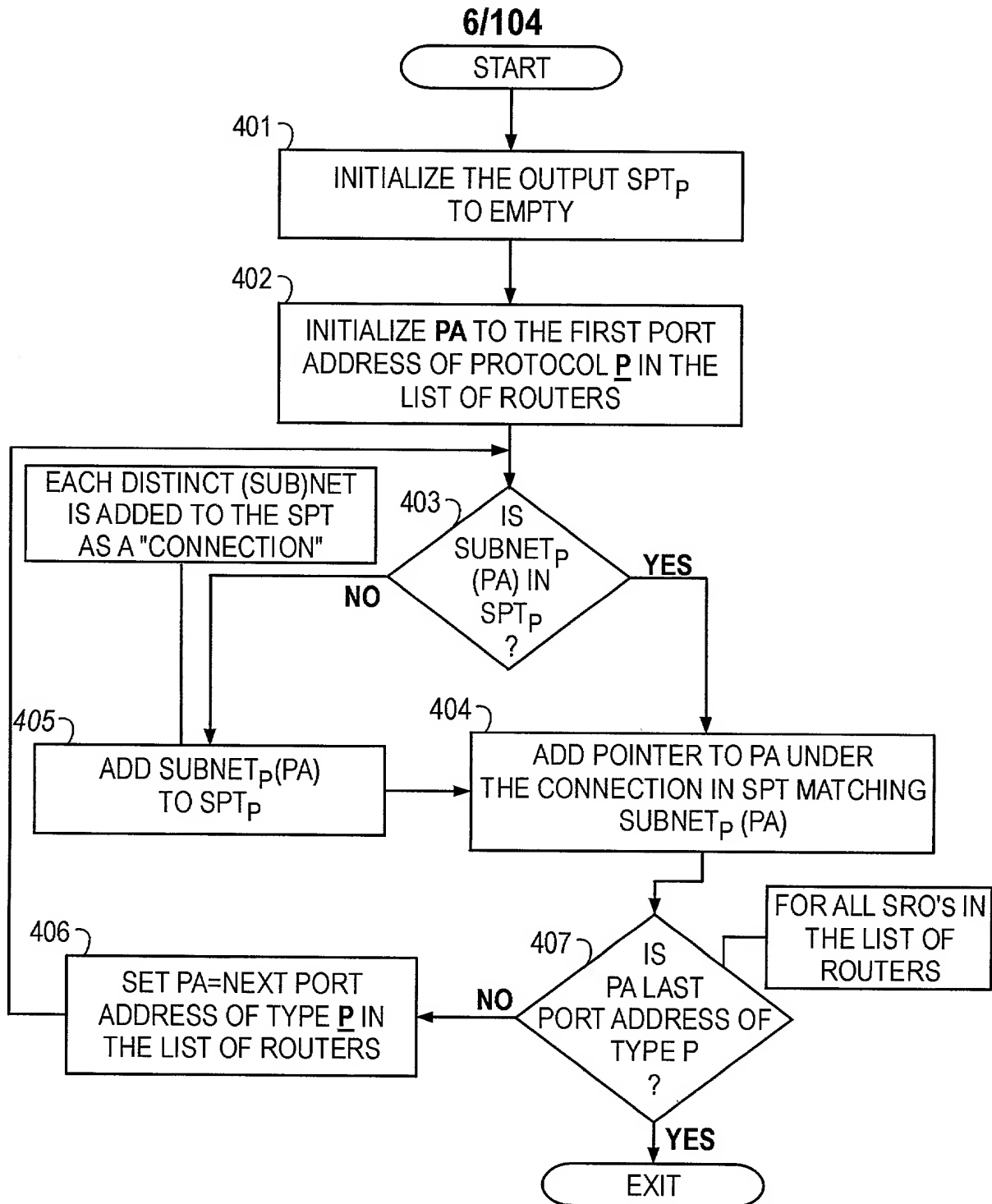


FIG. 4

7/104

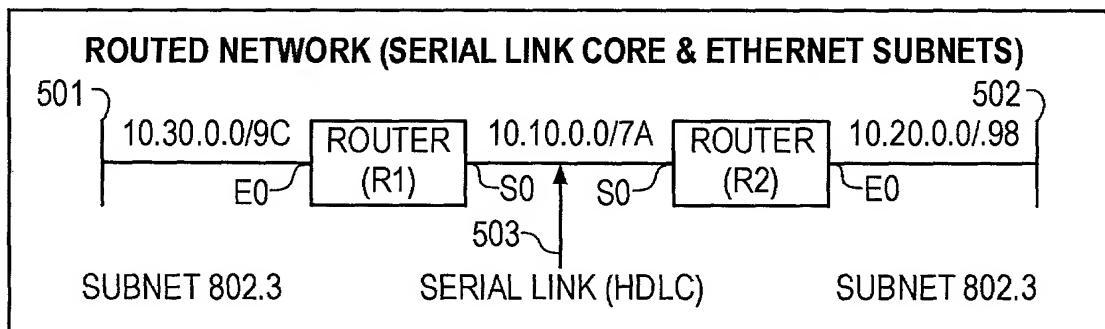


FIG. 5

ROUTER R1:

```

VERSION 10.0
!
HOSTNAME R1
!
NOVELL ROUTING 0000.0C08.94DD
!
INTERFACE ETHERNET0 602
IP ADDRESS 10.30.7.2 255.255.0.0
IPX NETWORK 9C
!
INTERFACE SERIAL0 601
IP ADDRESS 10.10.4.1 255.255.0.0
IPX NETWORK 7A
BANDWIDTH 1000
!
ROUTER IGRP 109
NETWORK 10.0.0.0
!
    
```

FIG. 6A

ROUTER R2:

```

VERSION 10.0
!
HOSTNAME R2
!
NOVELL ROUTING 0000.0C04.3A3E
!
INTERFACE ETHERNET0
IP ADDRESS 10.20.5.2 255.255.0.0
IPX NETWORK 98
!
INTERFACE SERIAL0
IP ADDRESS 10.10.4.2 255.255.0.0
IPX NETWORK 7A
!
ROUTER IGRP 109
NETWORK 10.0.0.0
!
! STATIC ROUTE DEFINITION
IP 70.70.3.0 255.255.0.0 199.37.28.3
    
```

FIG. 6B

100485 034001

8/104

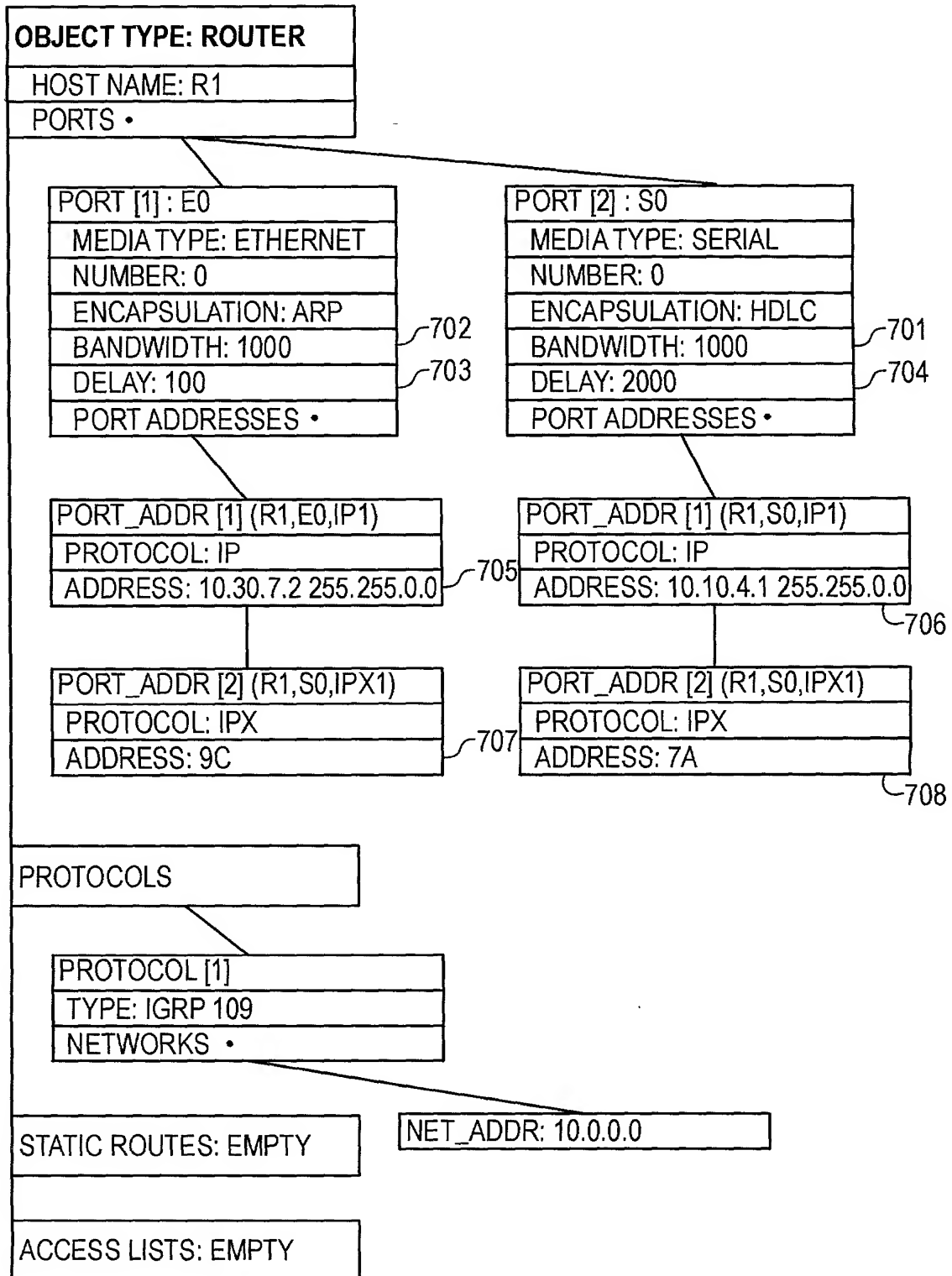


FIG. 7A

9/104

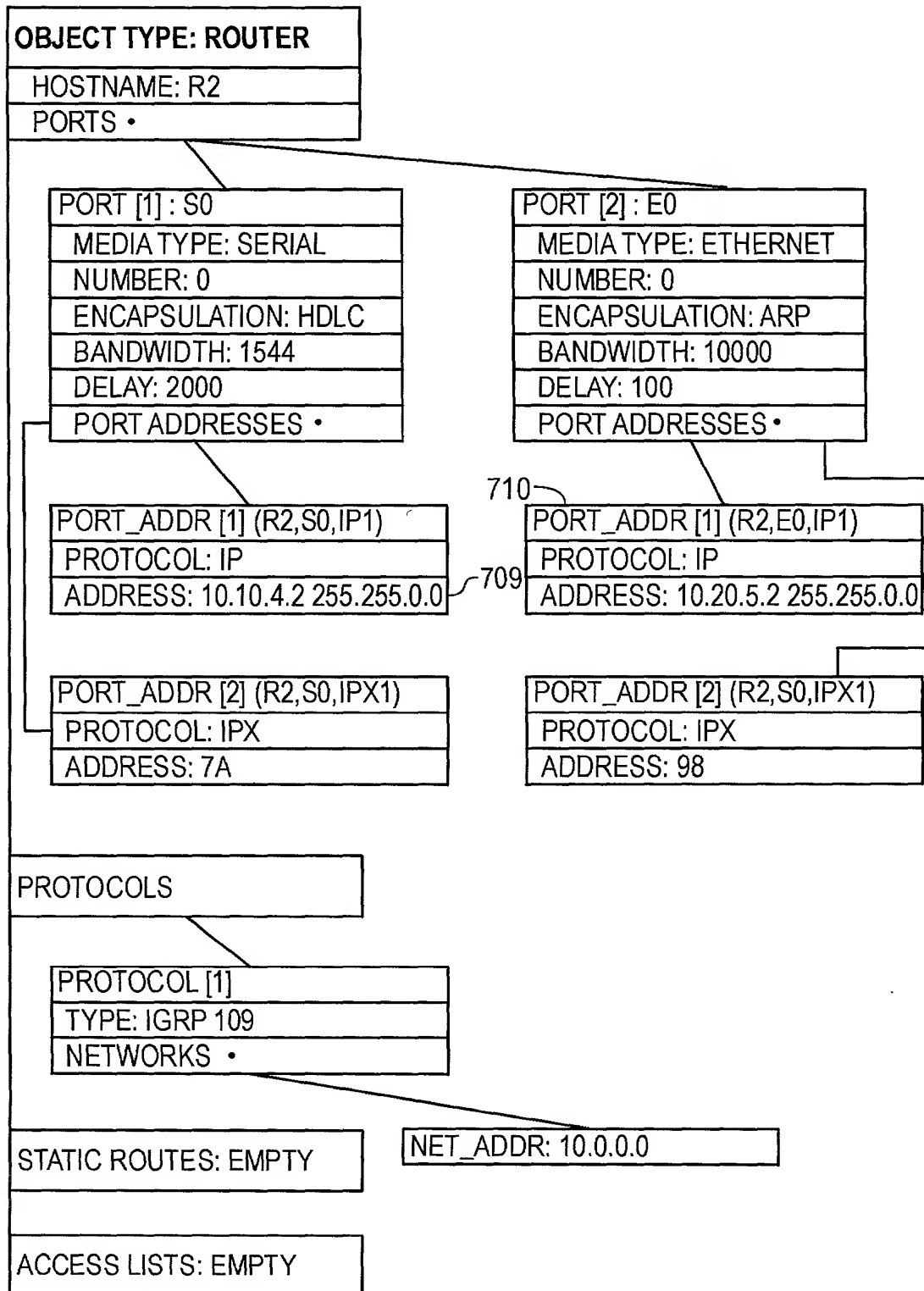


FIG. 7B

10/104

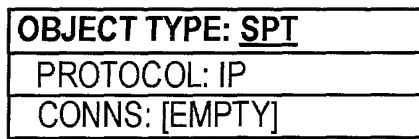


FIG. 8A

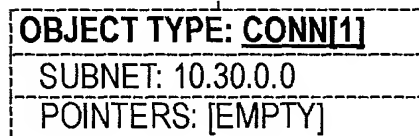
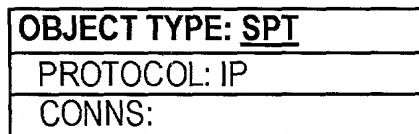


FIG. 8B

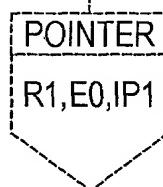
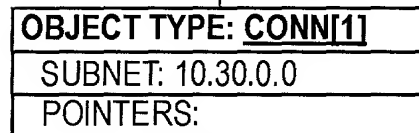
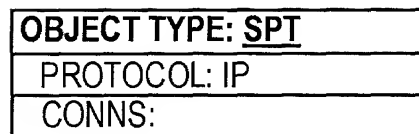
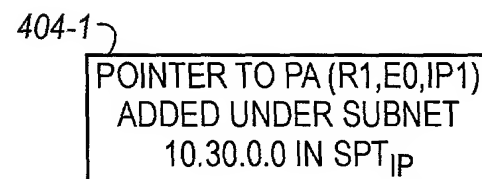
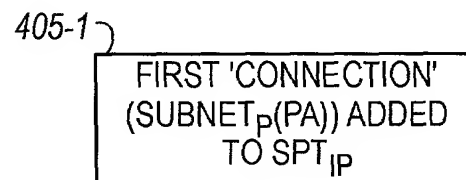
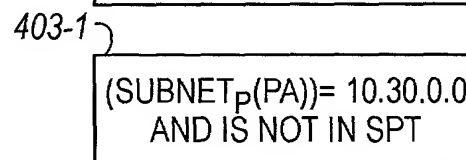
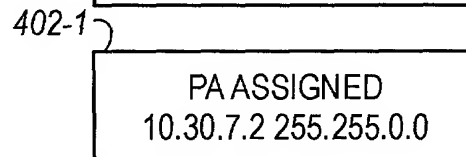
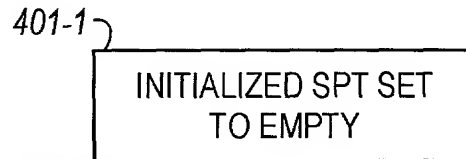
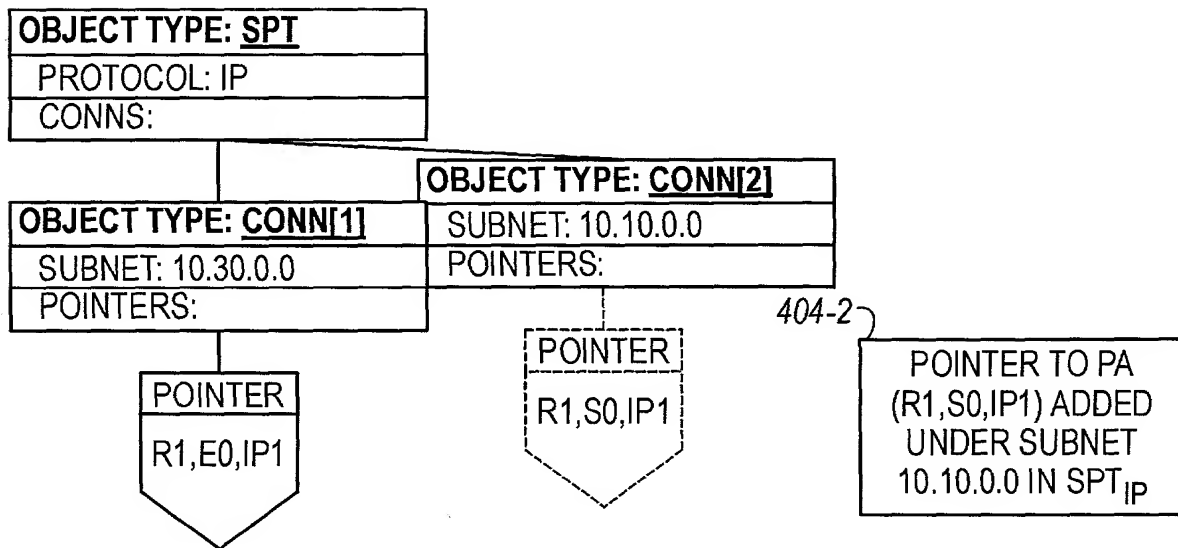
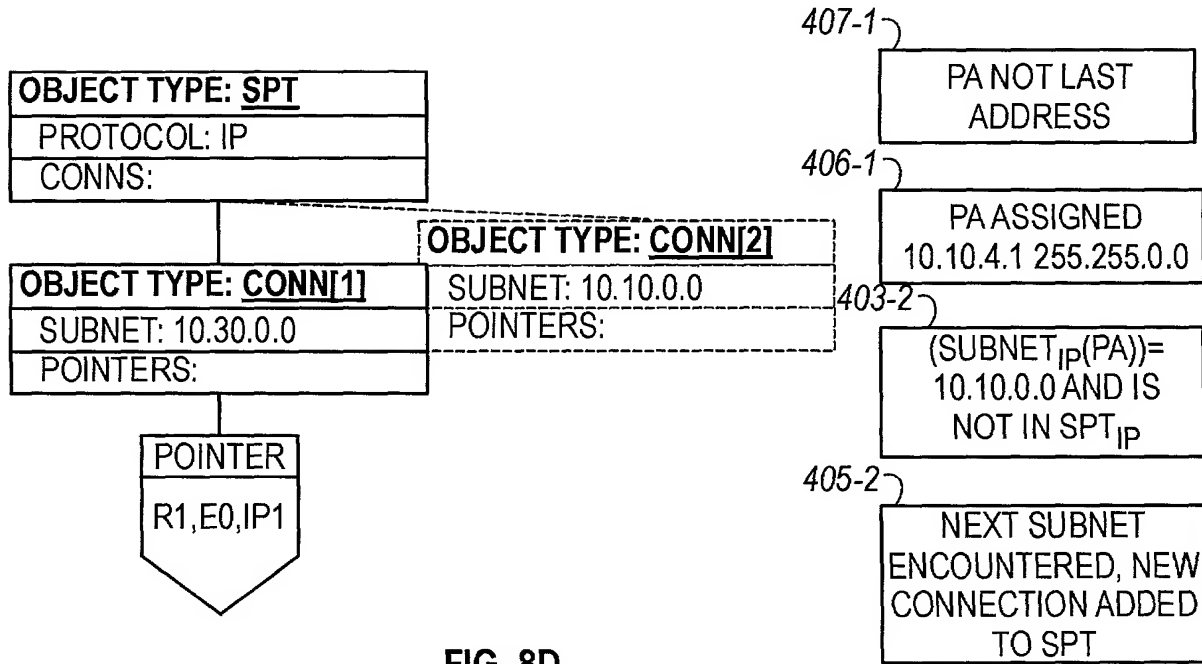


FIG. 8C



11/104



12/104

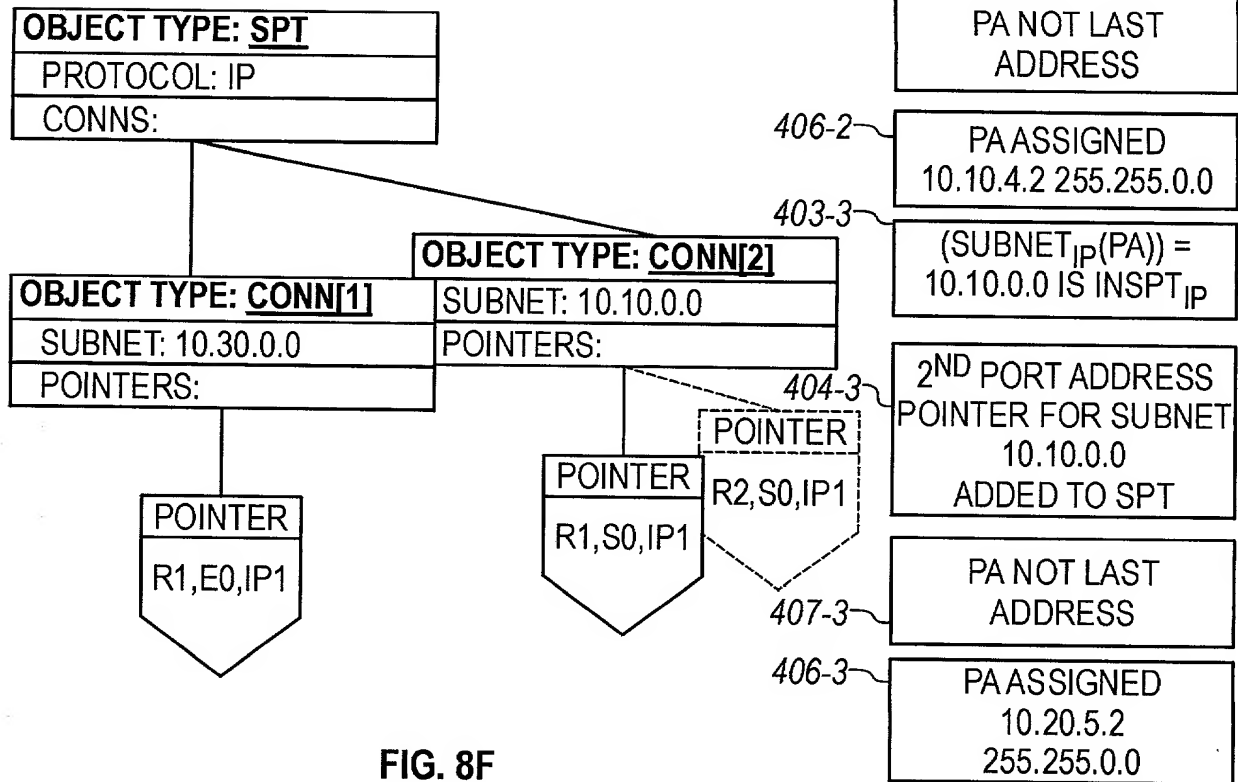


FIG. 8F

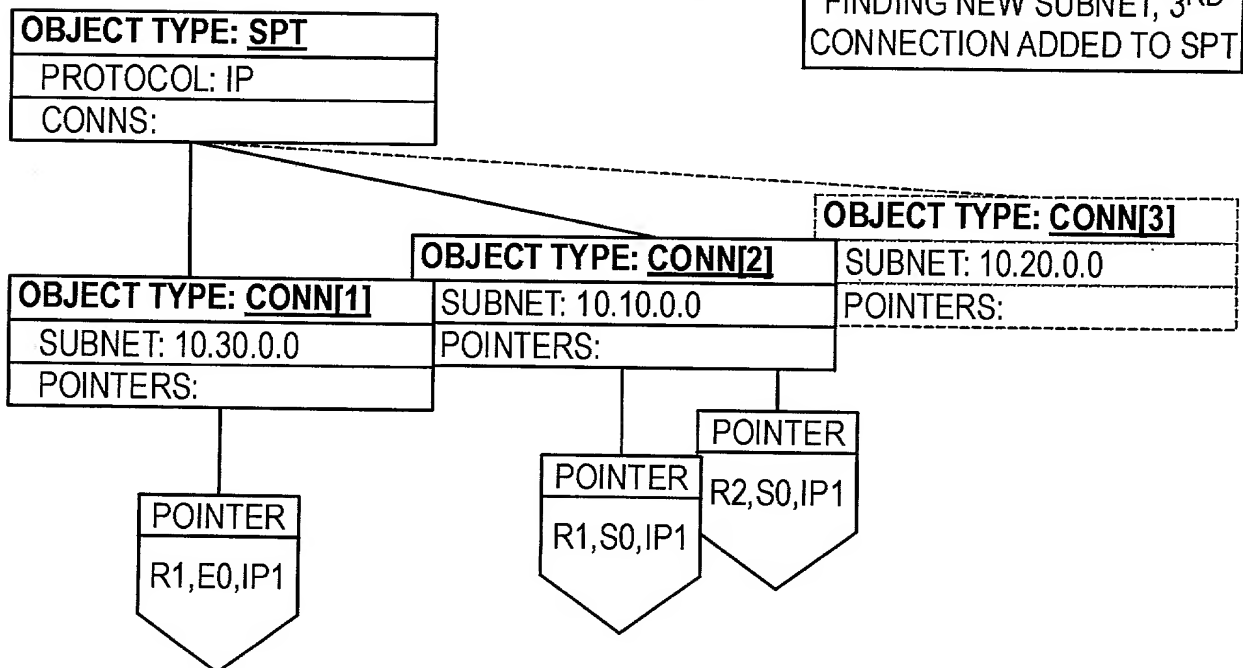


FIG. 8G

13/104

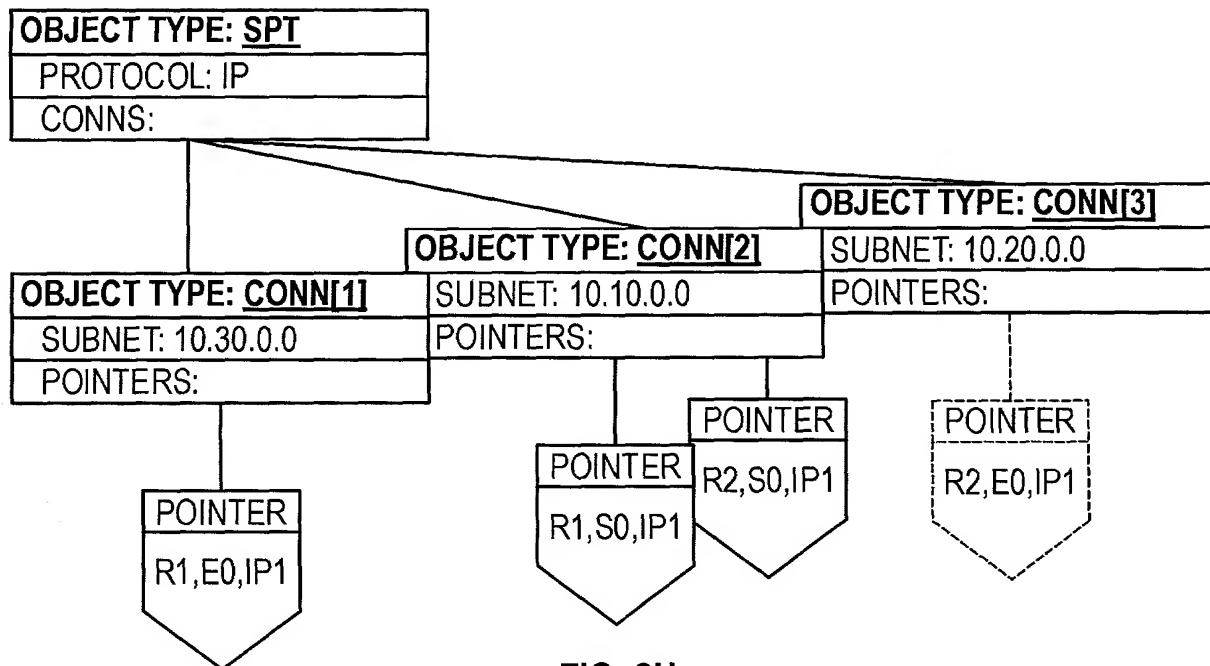


FIG. 8H

404-4 }
 PORT ADDRESS FOR SUBNET
 10.20.0.0 ENCOUNTERED,
 POINTER ADDED TO SPT

407-4 }
 LAST PORT ADDRESS
 ENCOUNTERED: SPT FOR IP
 COMPLETE

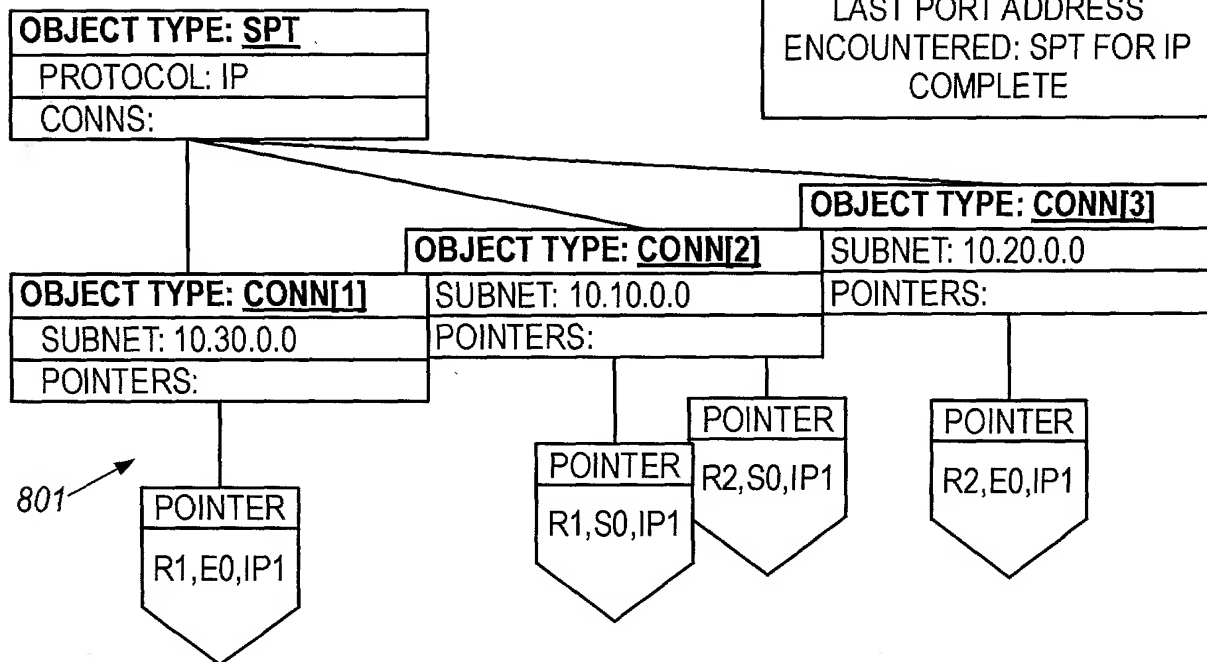


FIG. 8I

202405 50325-0630

14/104

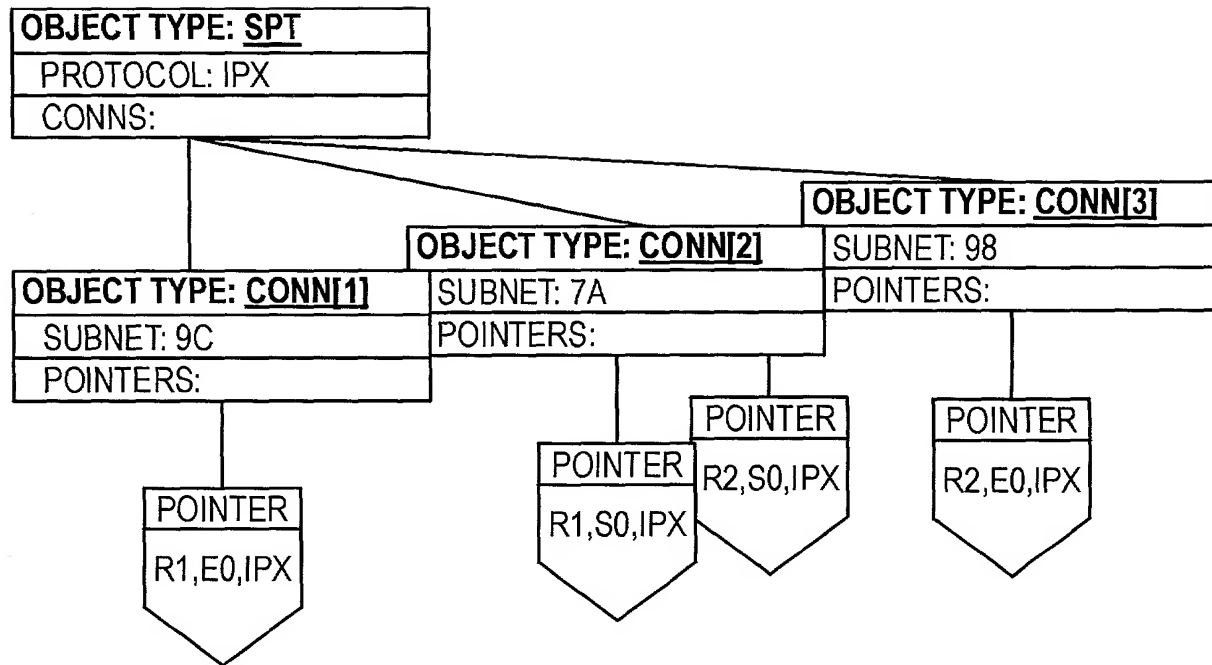
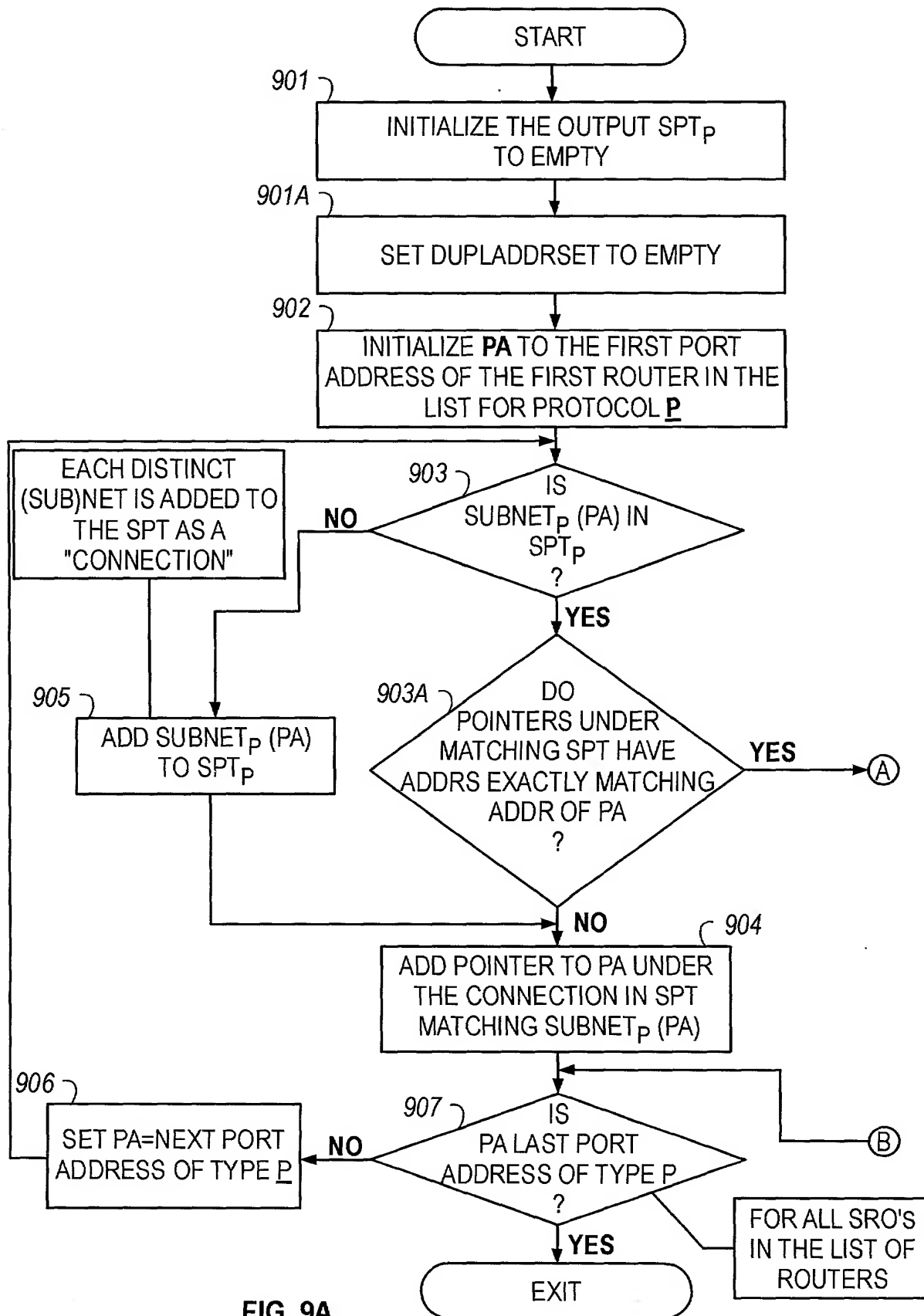


FIG. 8J

15/104



16/104

NOTE
AS REFERRED TO IN THIS FLOWCHART THE TERM "DUPLADDRSET"
CONNOTES A SET OF PORT ADDRESS SETS THAT CAPTURE THE
PORT ADDRESSES THAT EXACTLY MATCH.
FOR EXAMPLE { {PA1, PA3, PA4} {PA9, PA7}} MEANS
PA1, PA3, & PA4 ALL REFER TO THE EXACT SAME ADDRESS
AND PA9 & PA7 REFER TO EXACTLY THE SAME ADDRESS

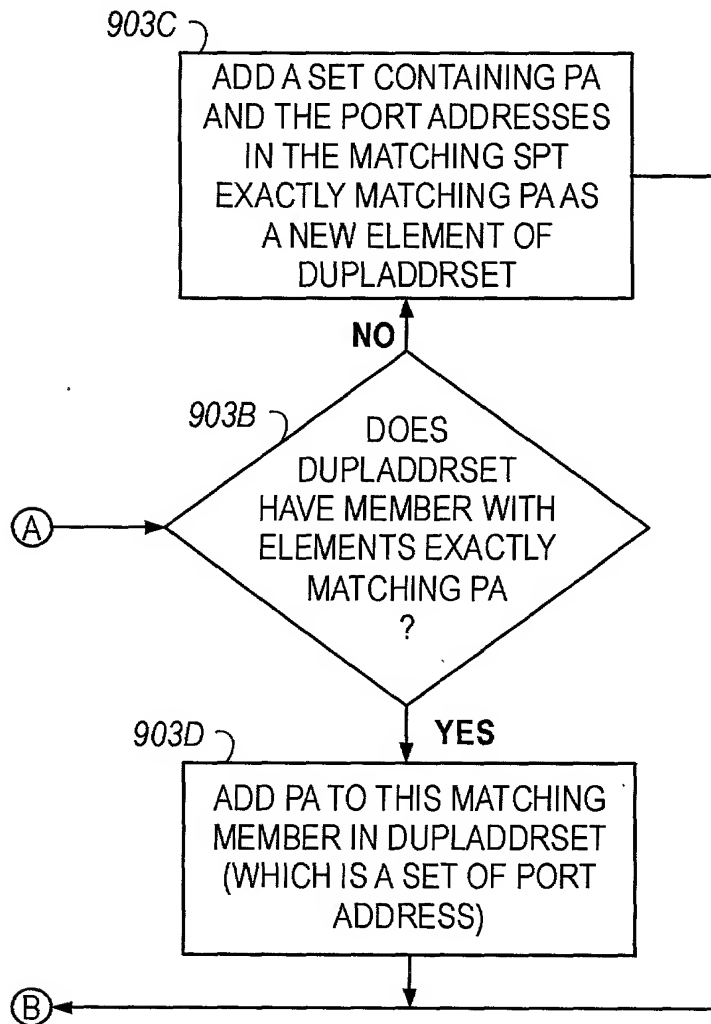
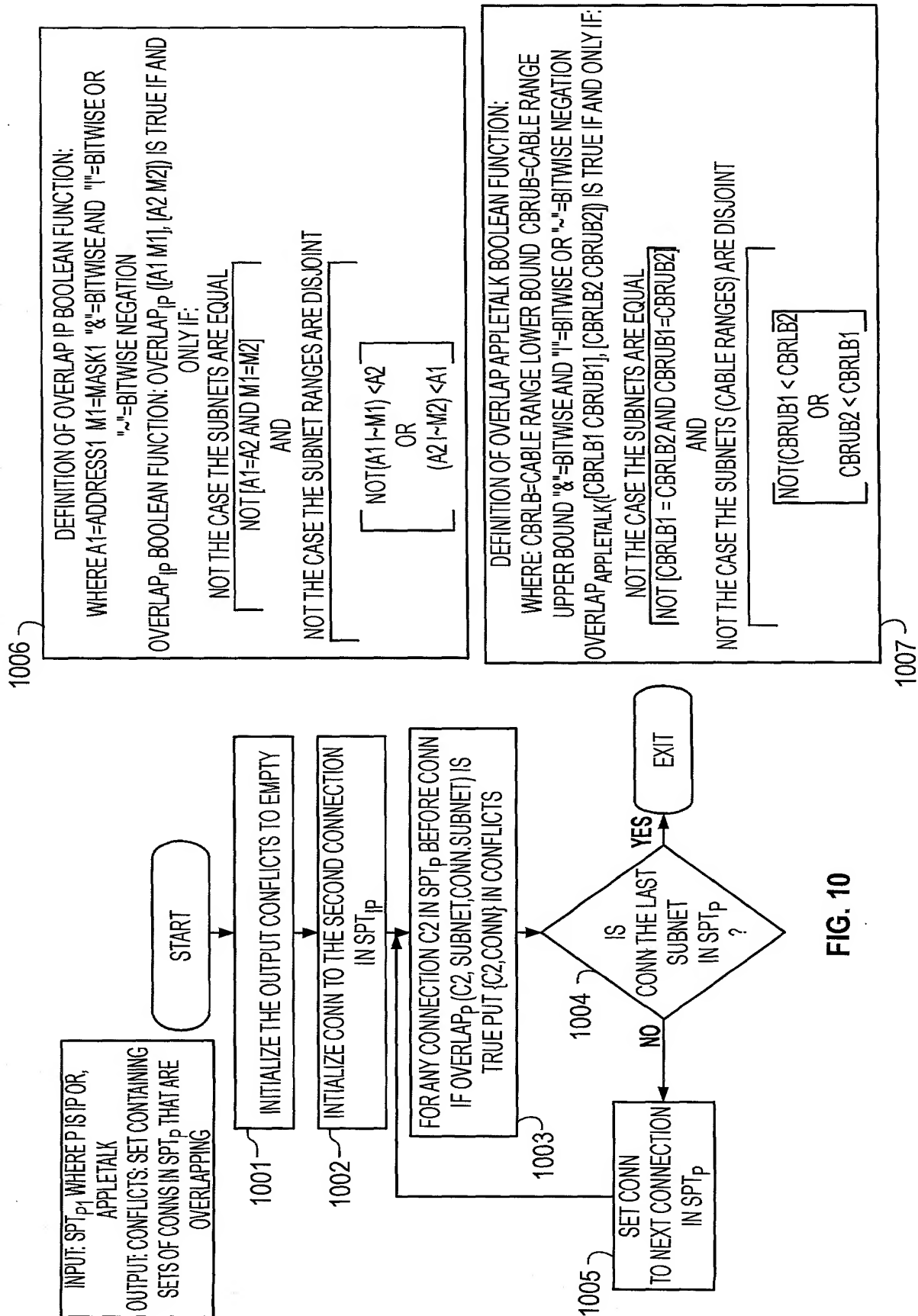


FIG. 9B

202 FEB 508400T

17/104



18/104

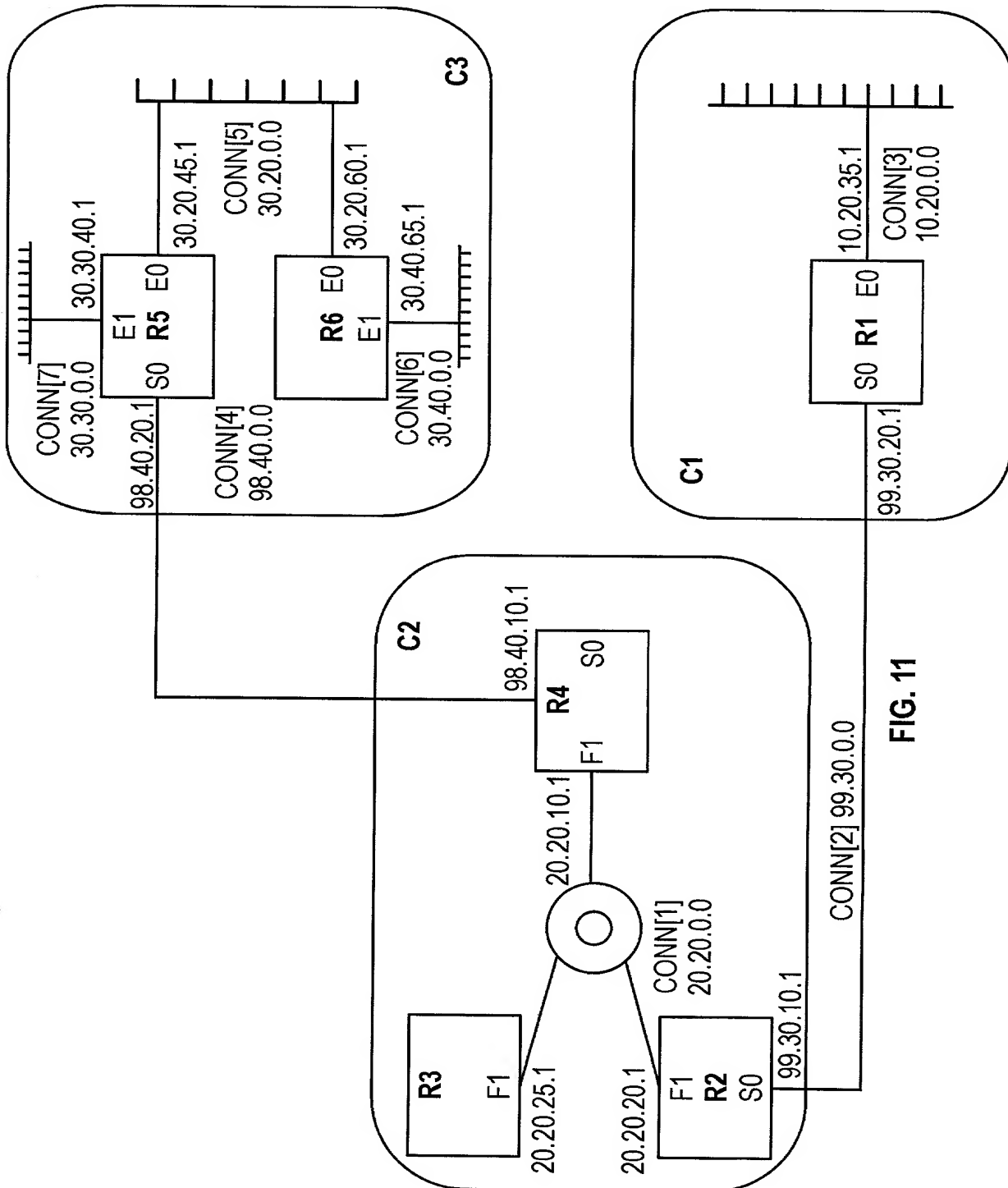


FIG. 11

19/104

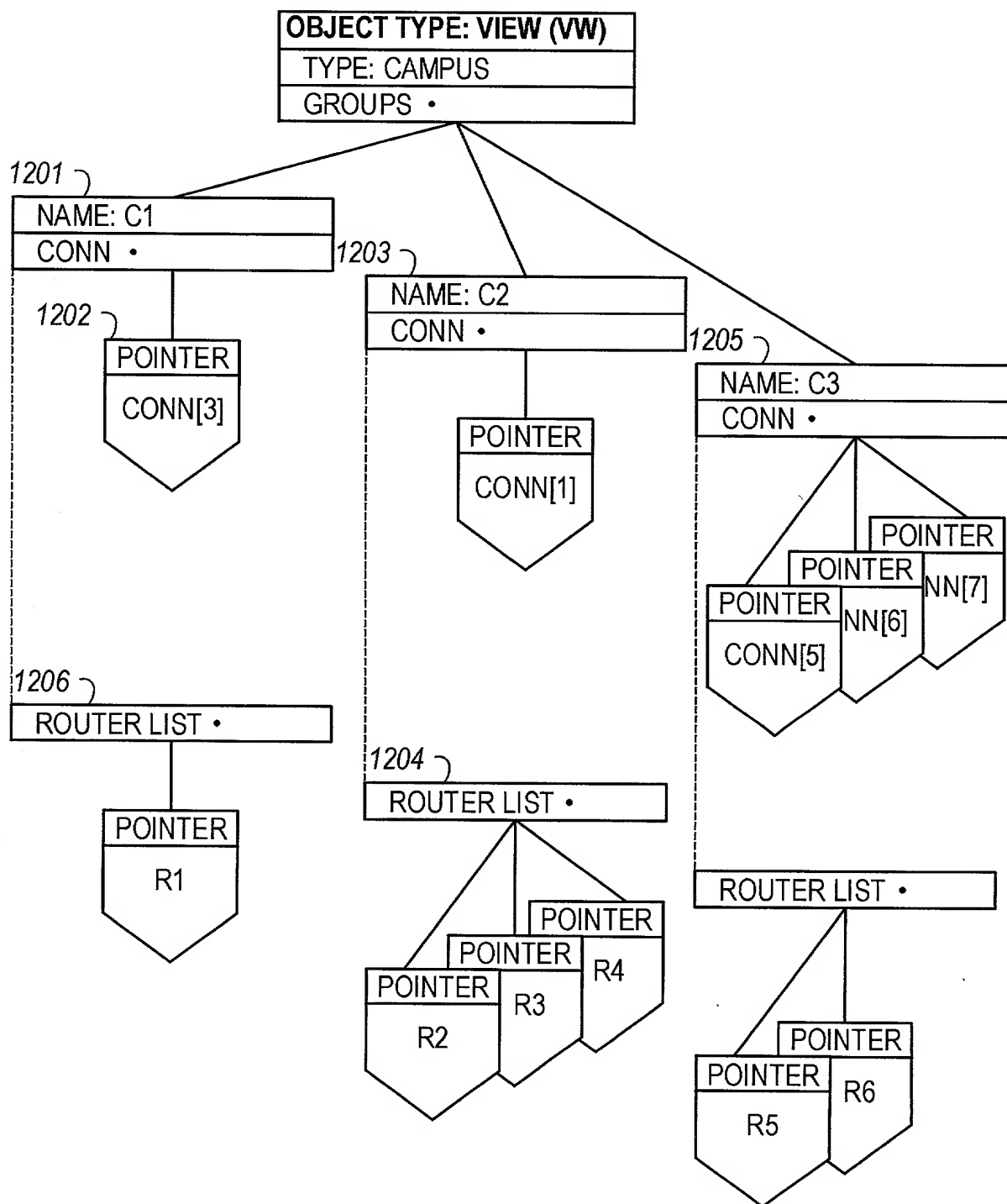
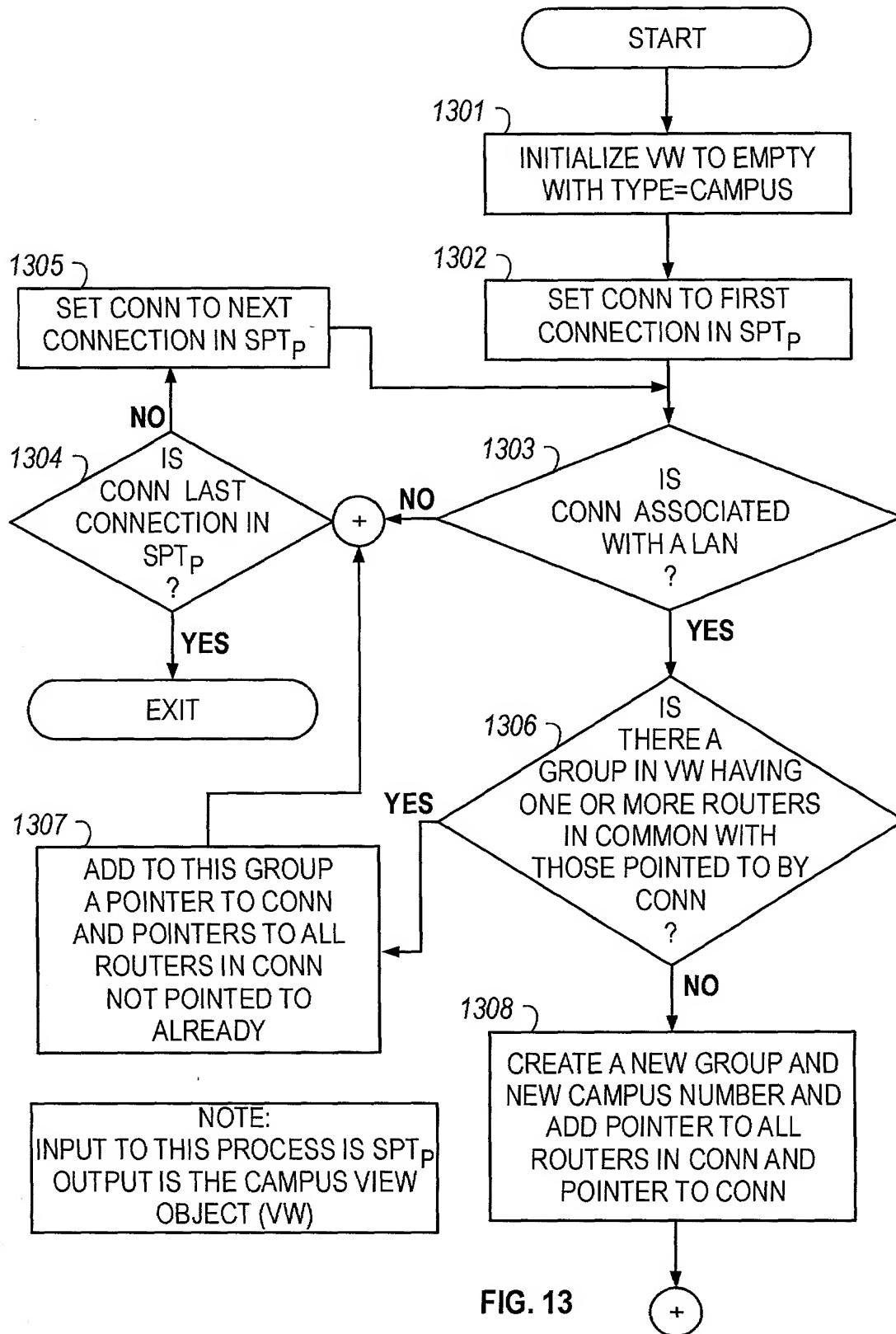


FIG. 12

20/104



21/104

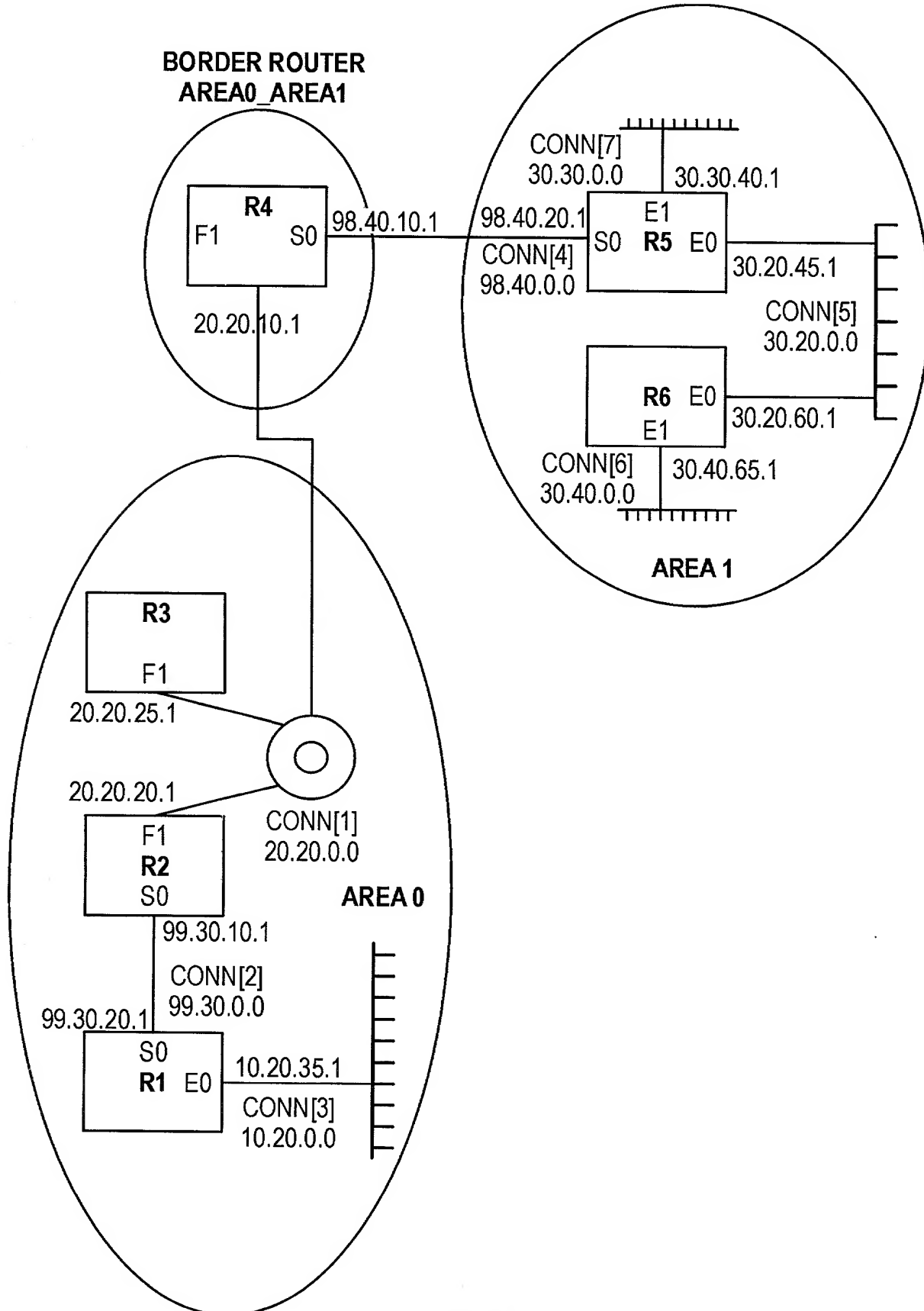


FIG. 14

22/104

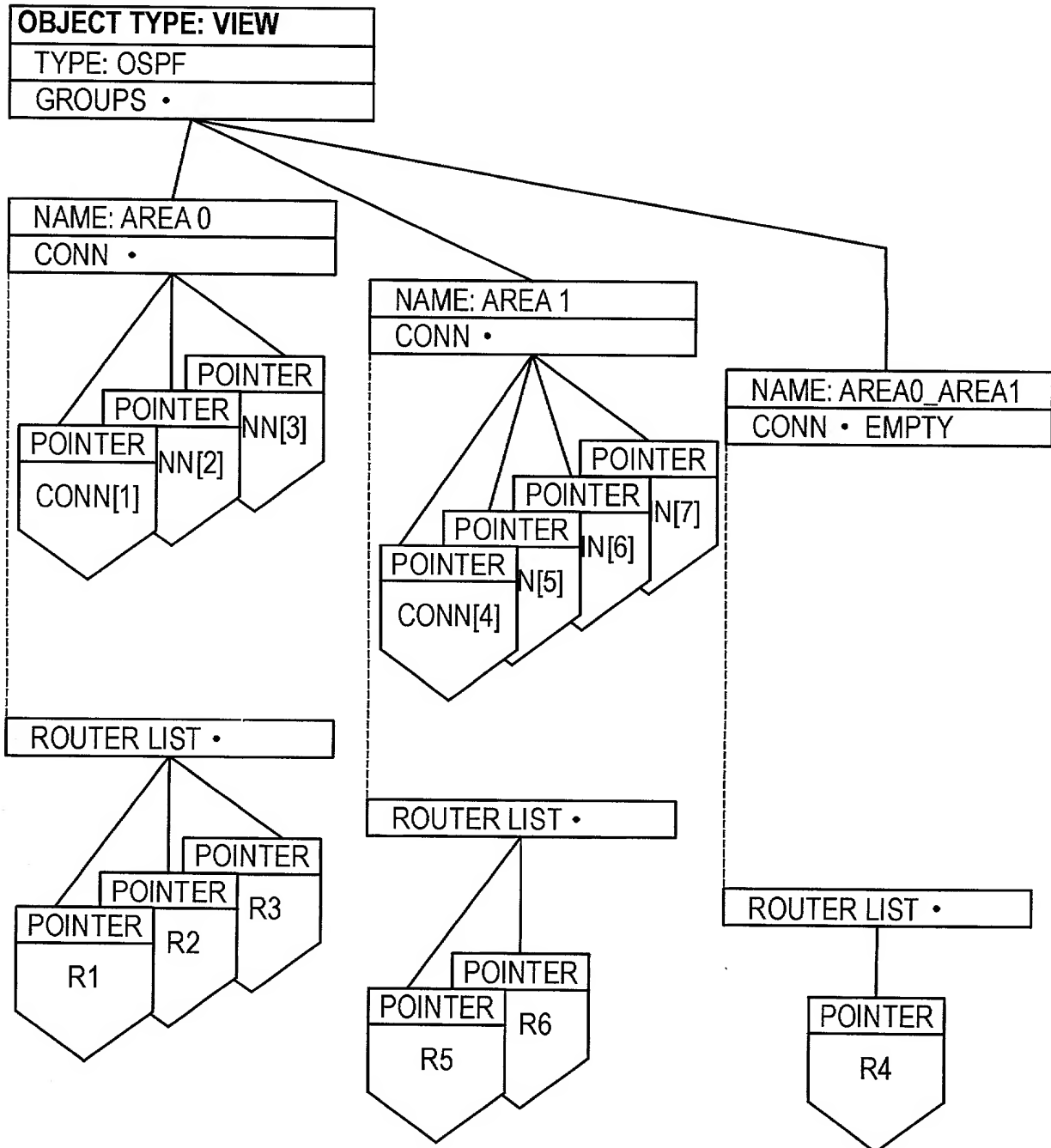


FIG. 15

23/104

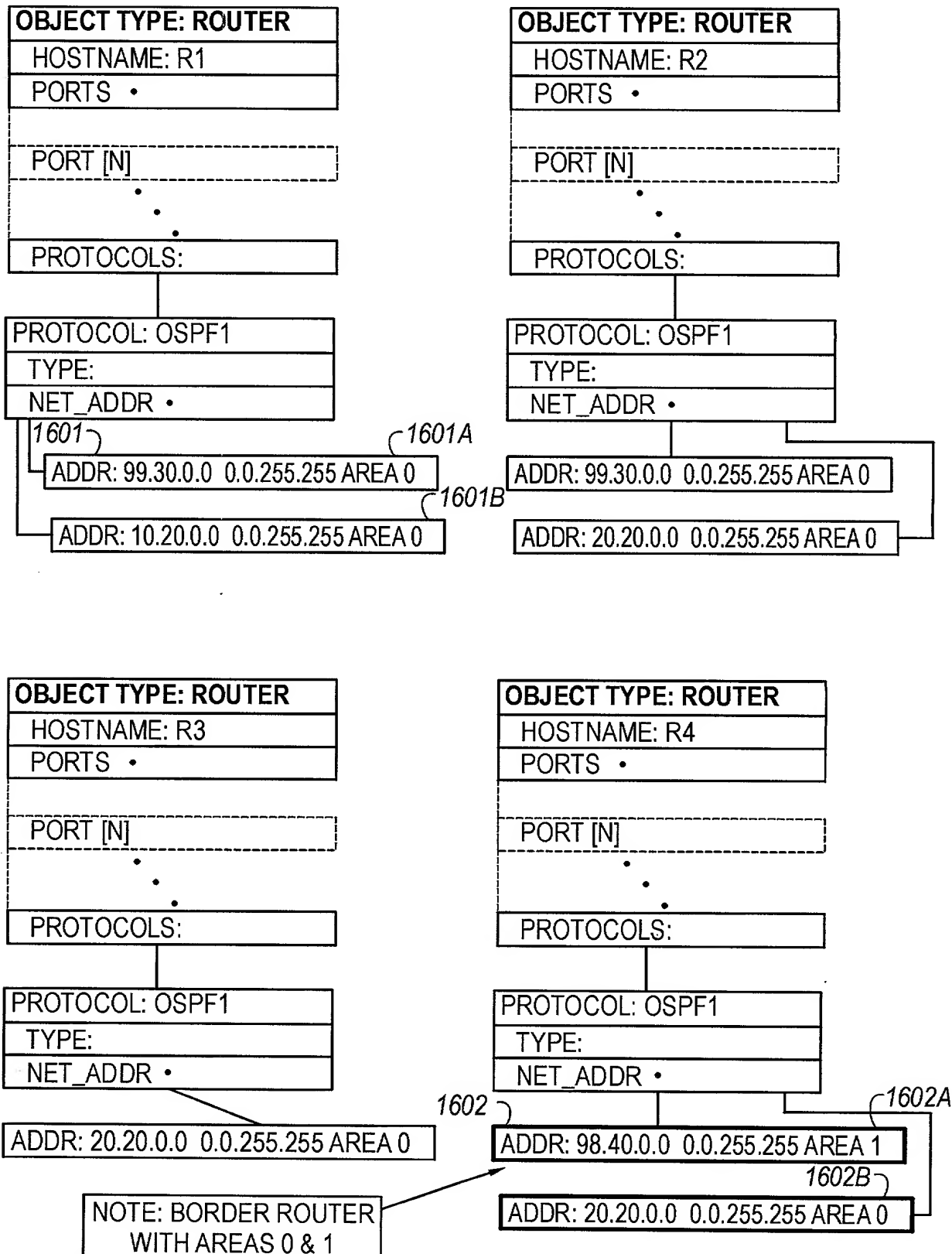


FIG. 16A

24/104

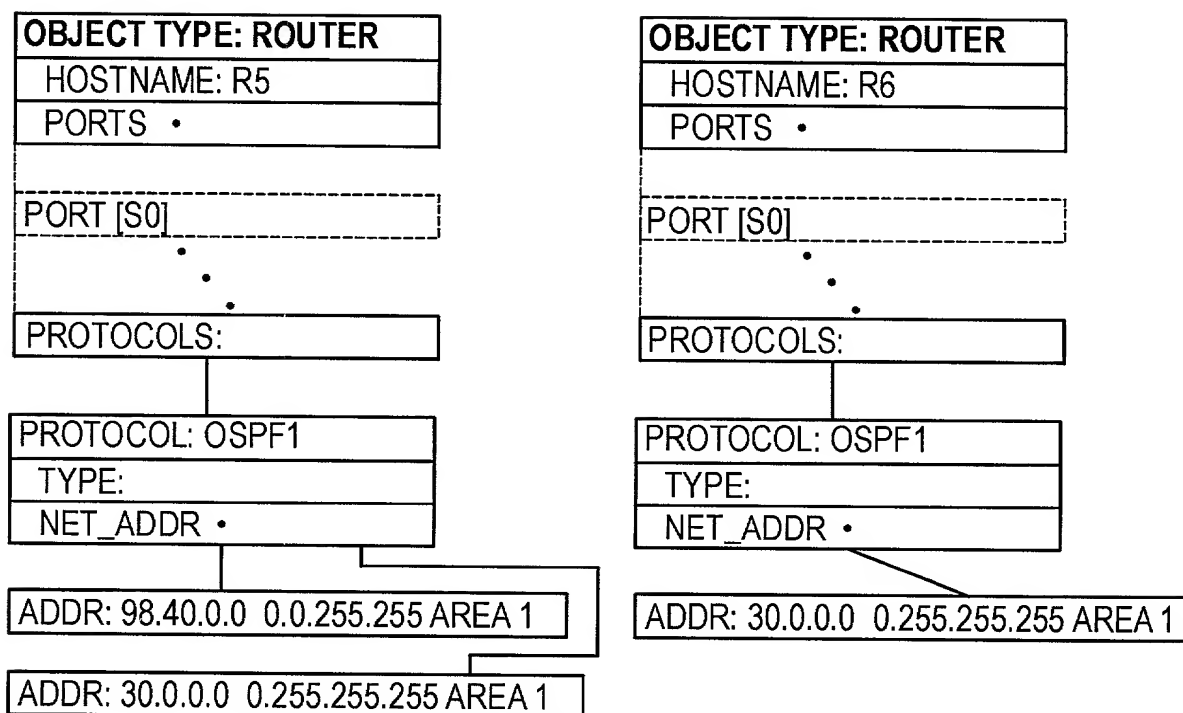
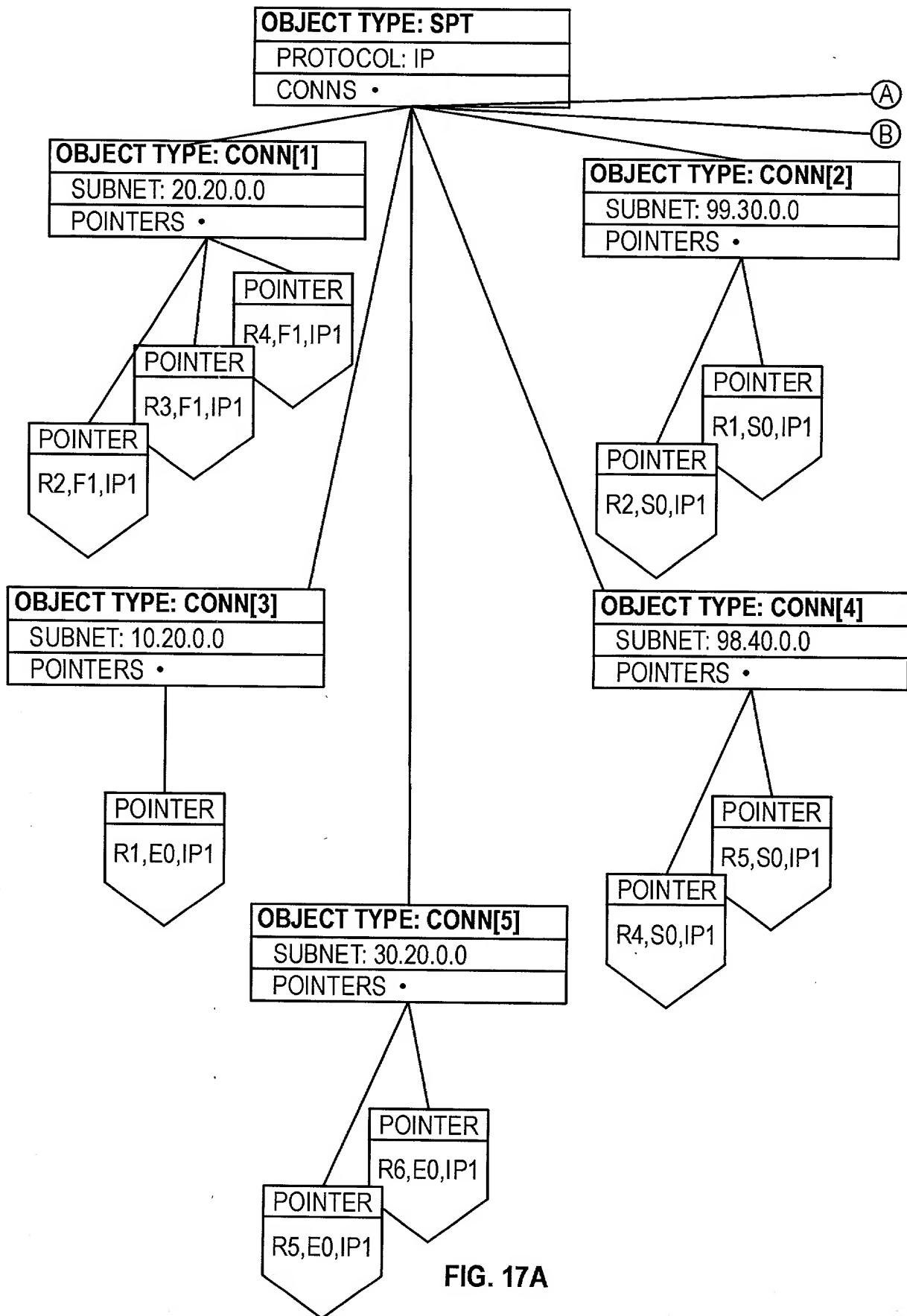


FIG. 16B

25/104



26/104

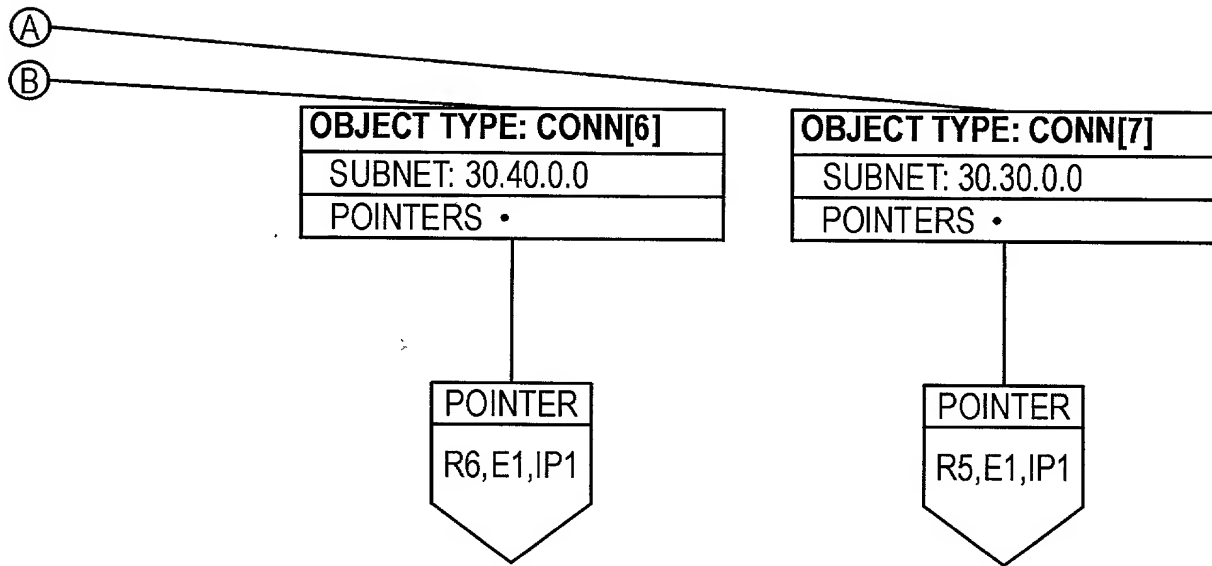


FIG. 17B

20250350374001

27/104

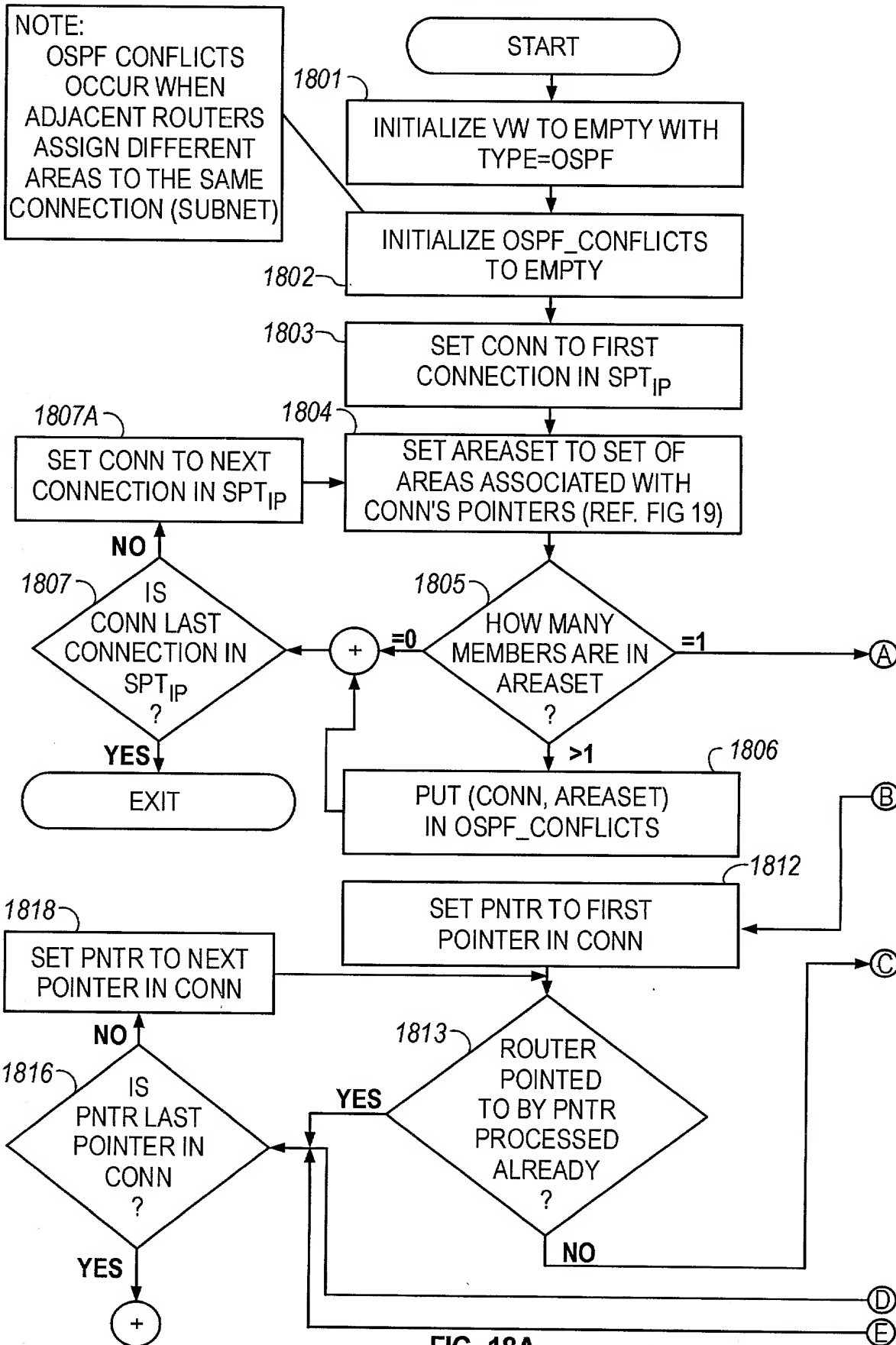


FIG. 18A

202120 50842001

28/104

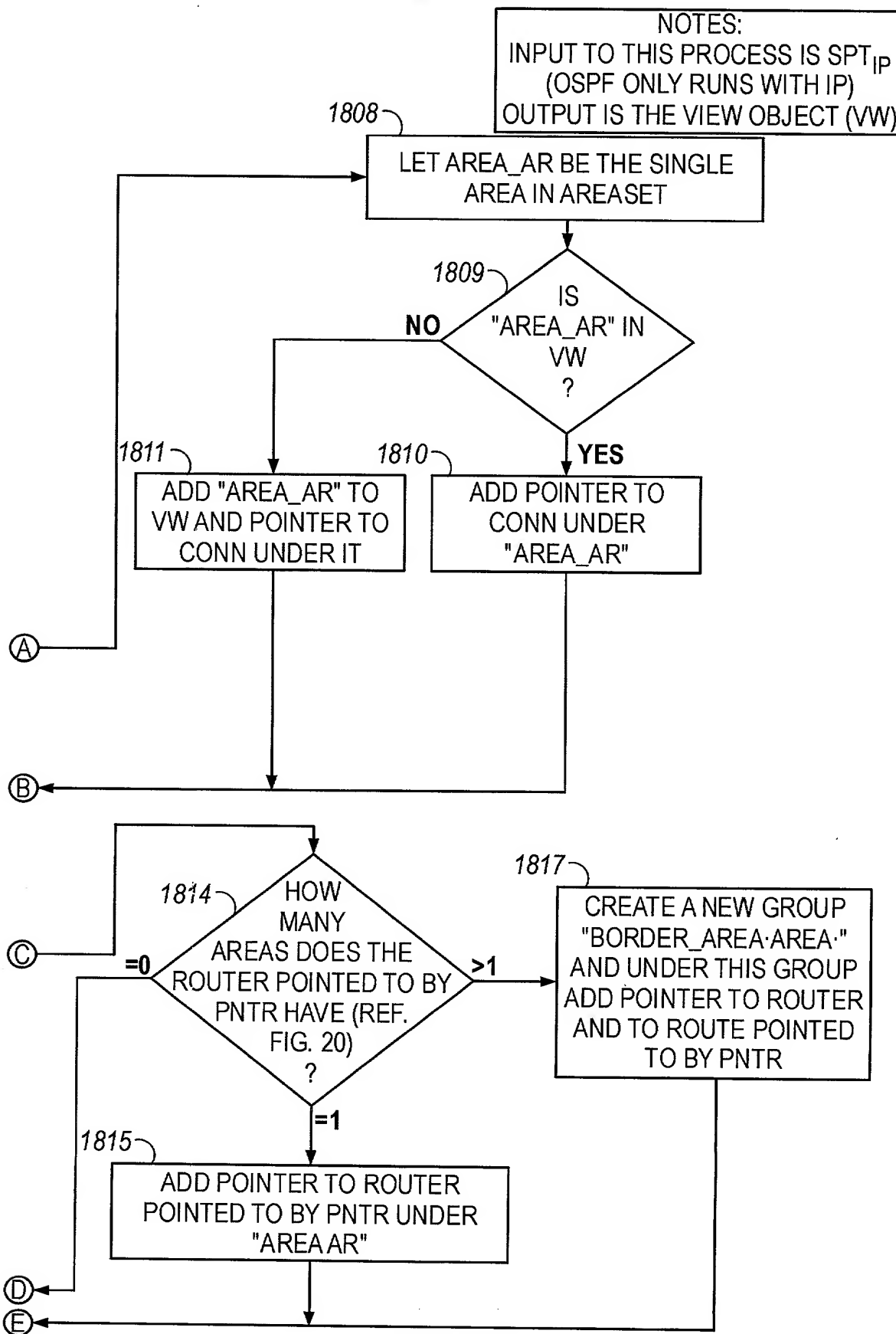


FIG. 18B

202120 508400

29/104

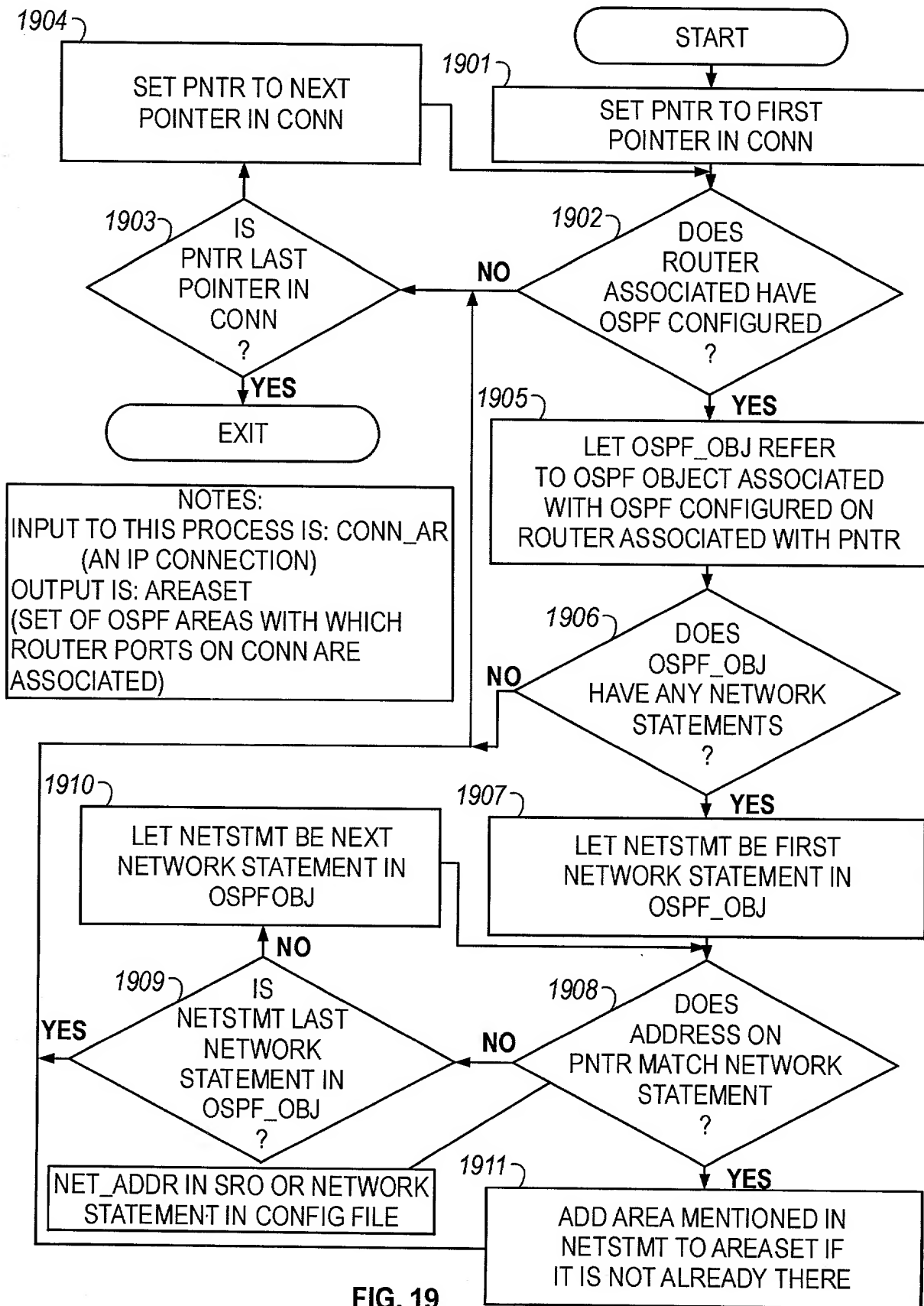


FIG. 19

20210905 10074605 001

30/104

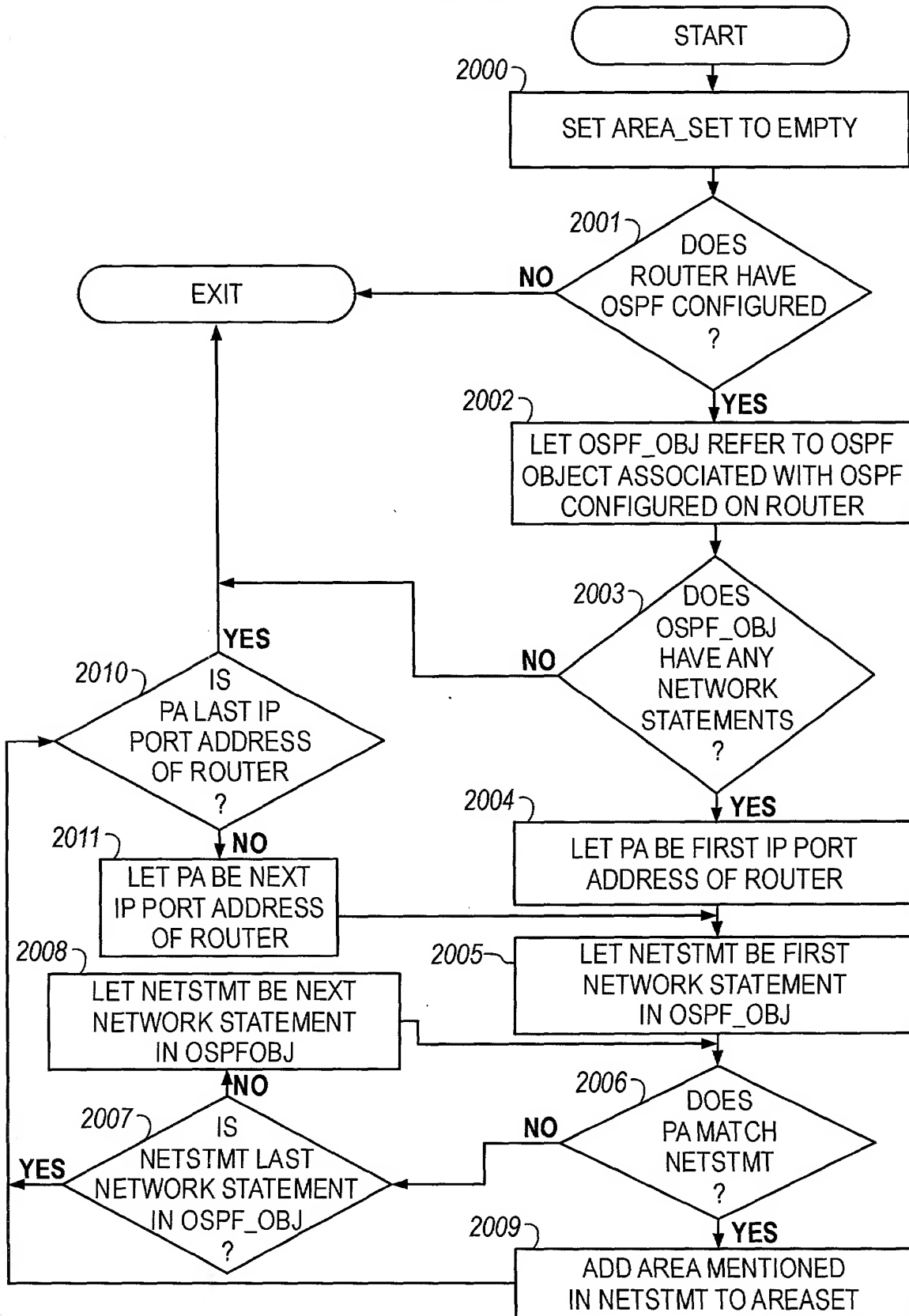


FIG. 20

31/104

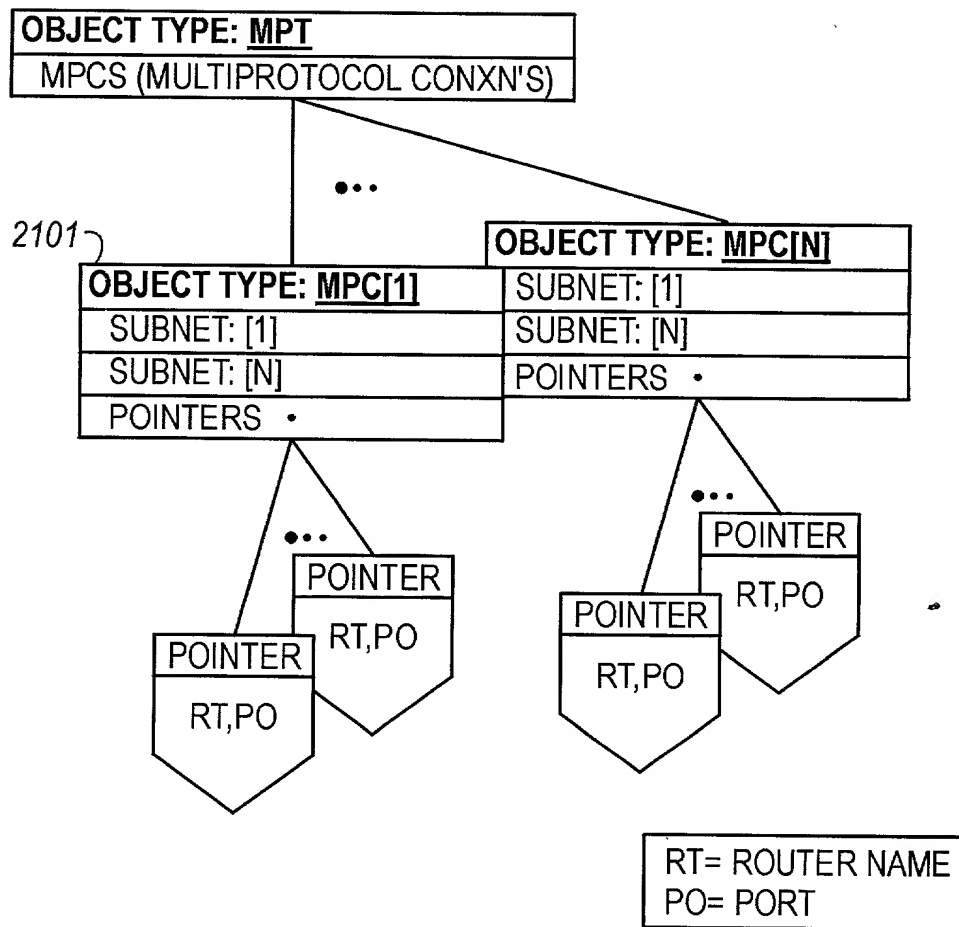


FIG. 21

32/104

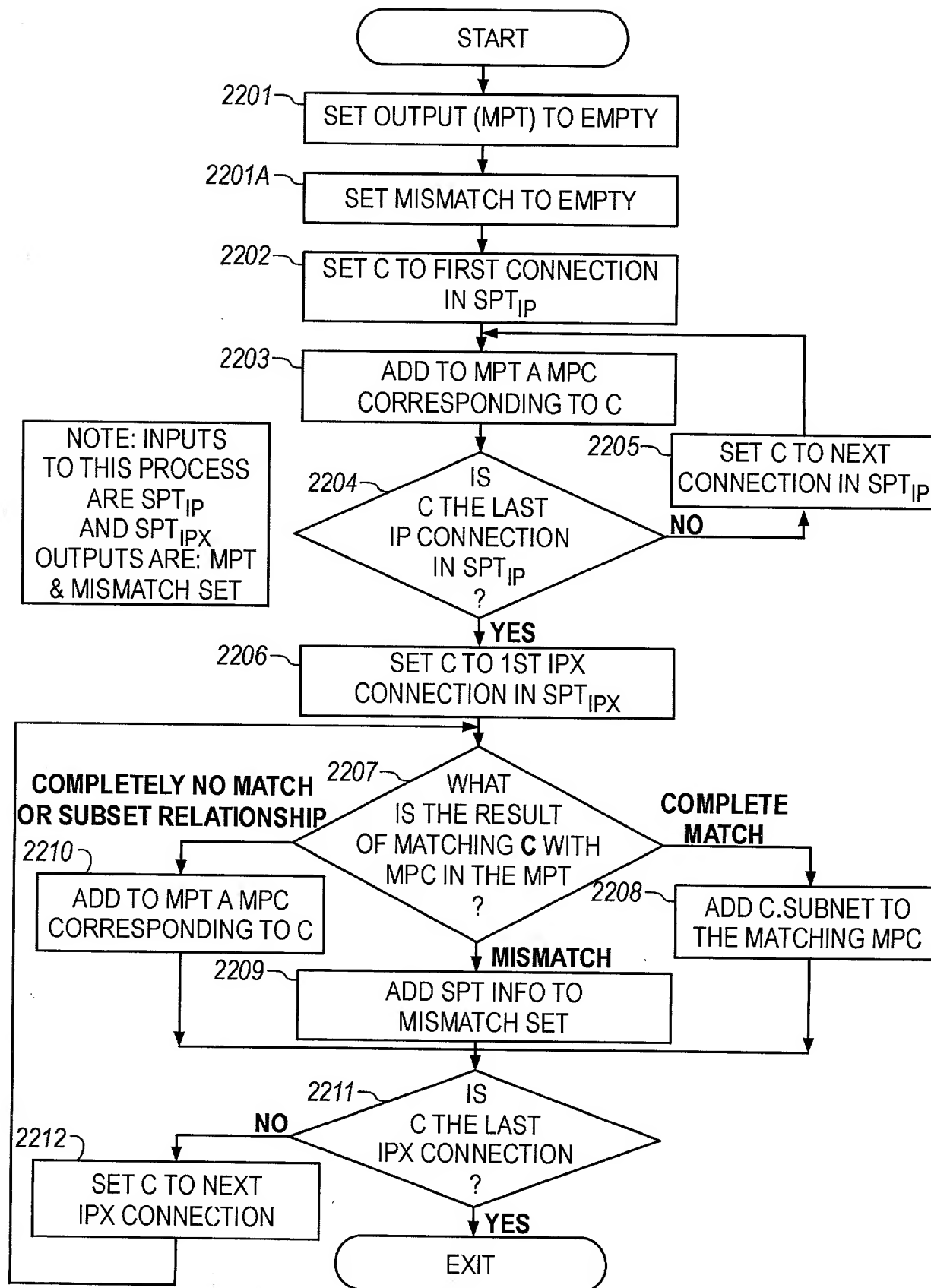


FIG. 22

33/104

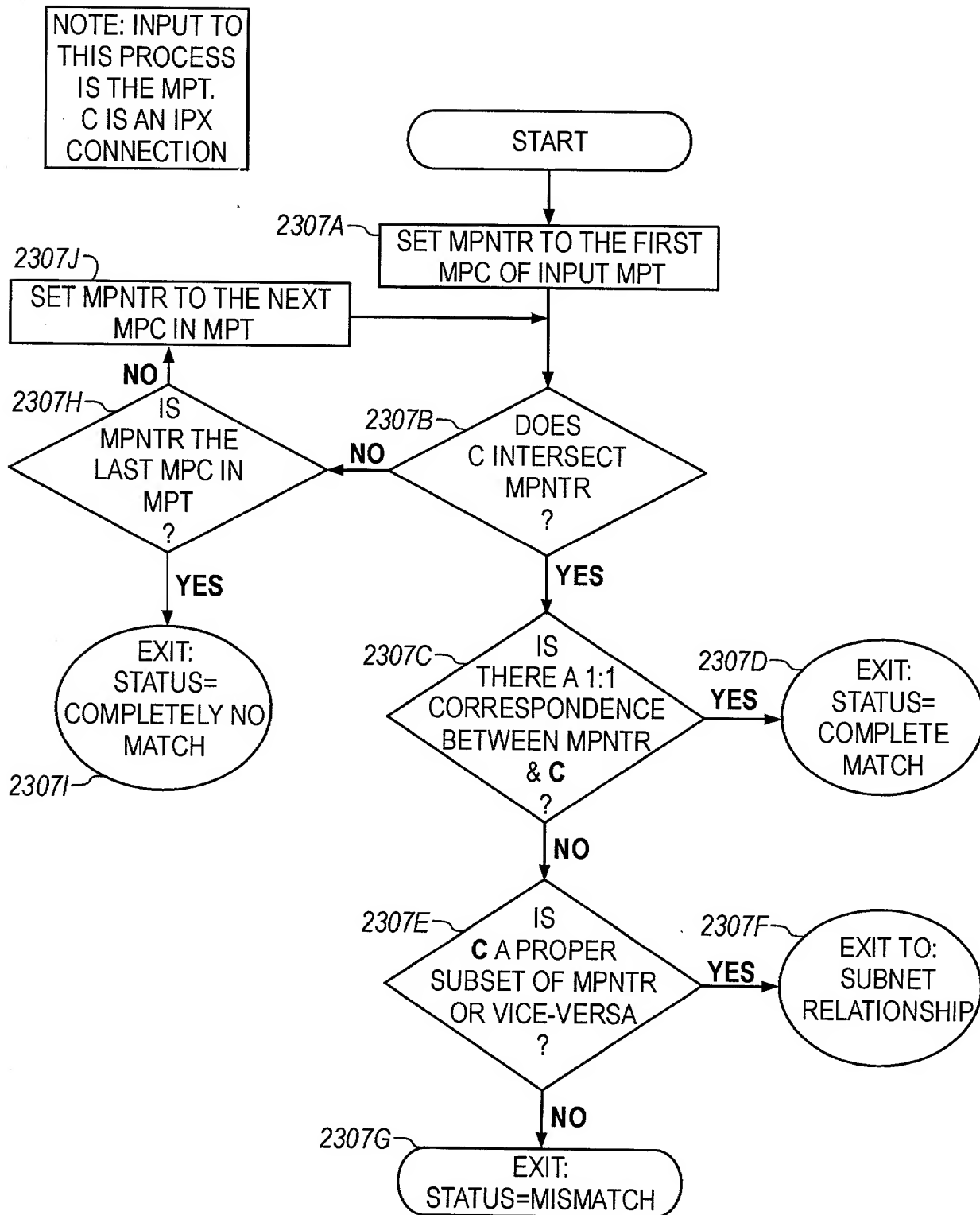


FIG. 23

34/104



FIG. 24A

NOTE: INPUTS TO THIS PROCESS
 ARE: SPT_{IP} AND SPT_{IPX}

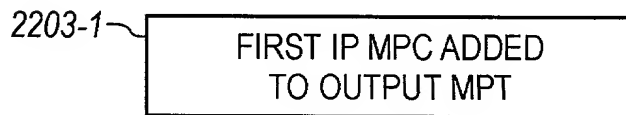
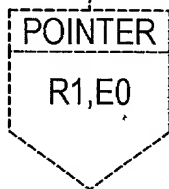
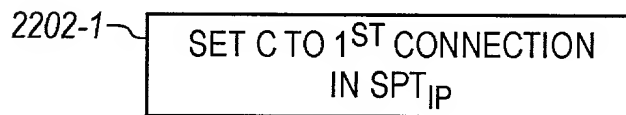
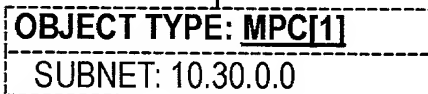
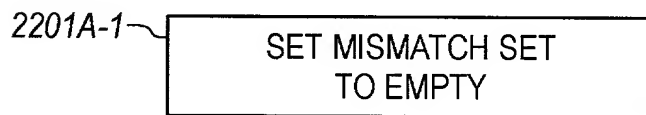
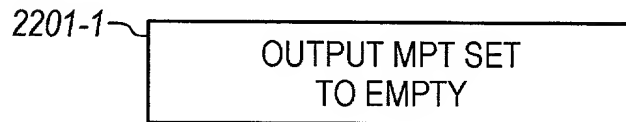


FIG. 24B



LOOPING THROUGH STEPS
 2203, 2204, 2205 ANOTHER IP
 MPC IS ADDED TO THE MPT

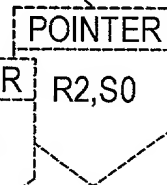
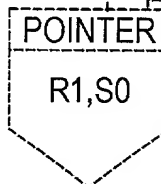
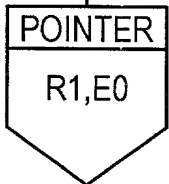
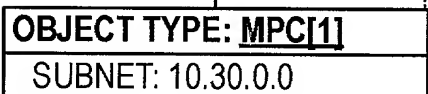


FIG. 24C

35/104

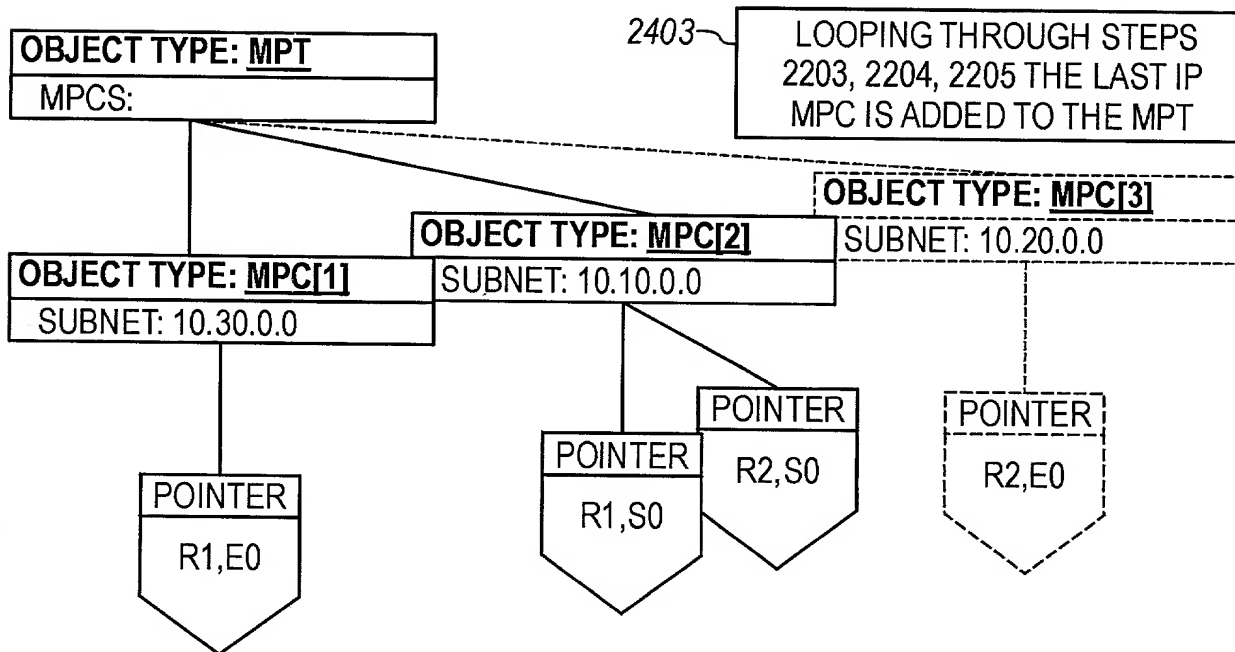


FIG. 24D

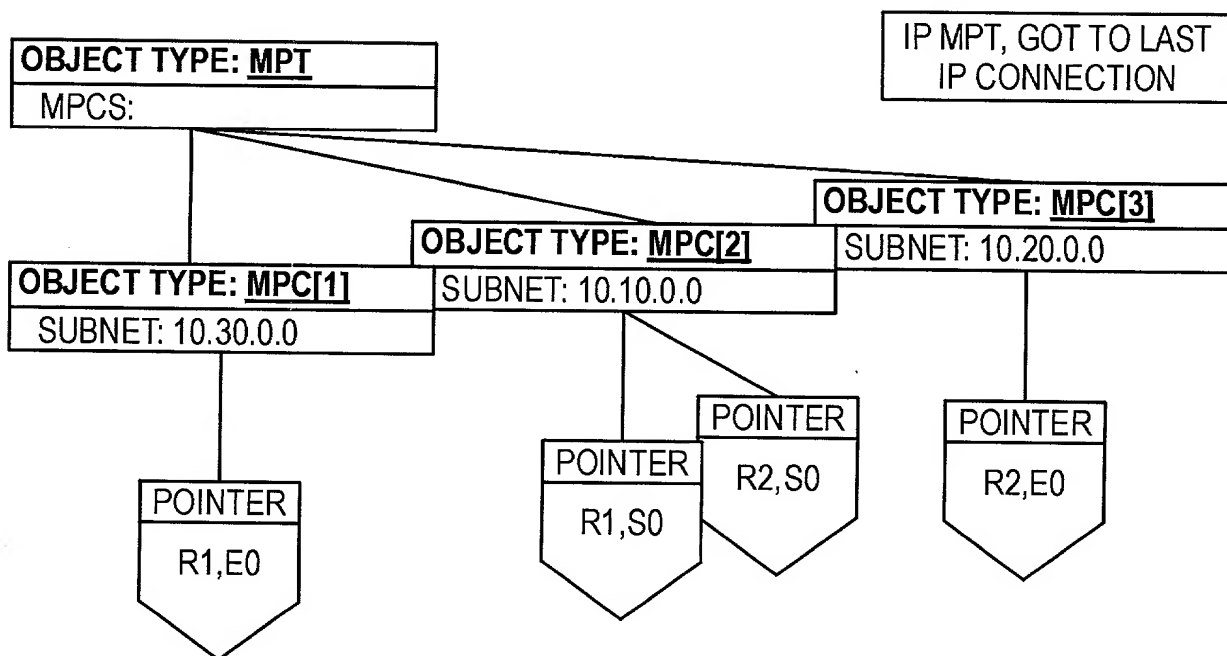


FIG. 24E

36/104

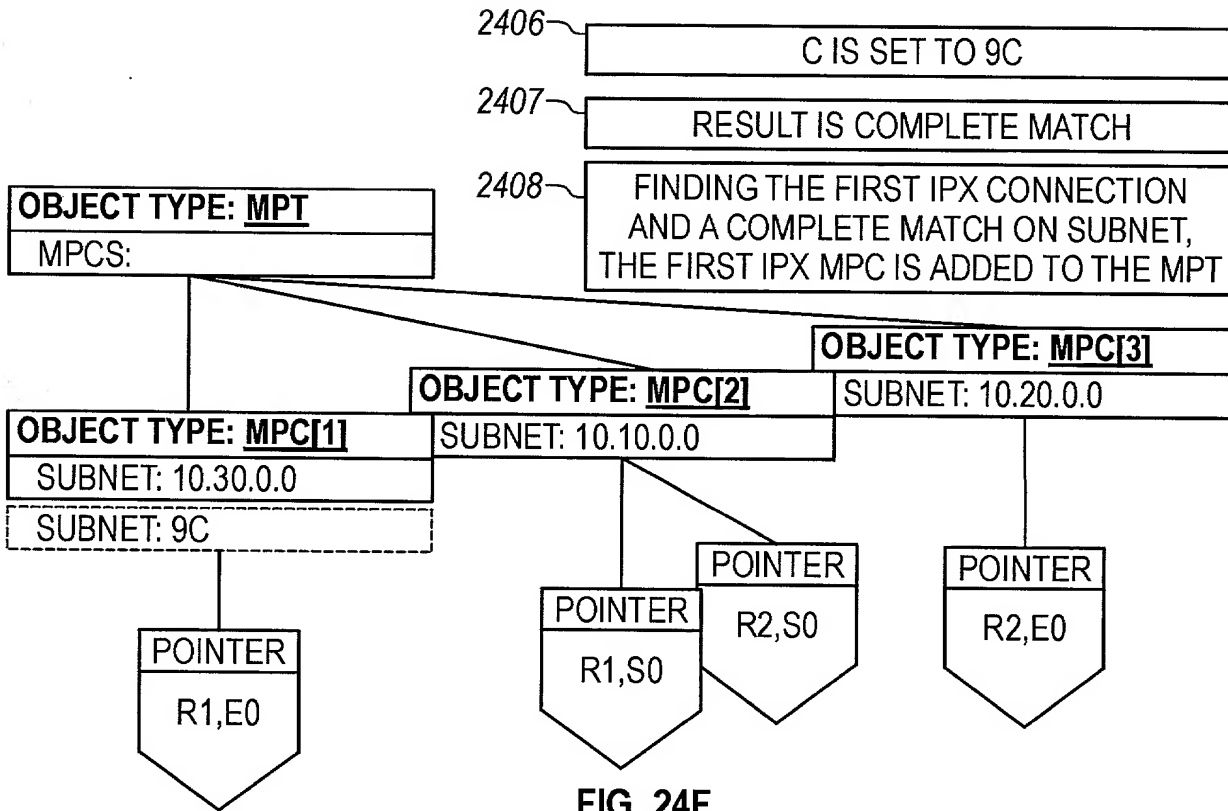


FIG. 24F

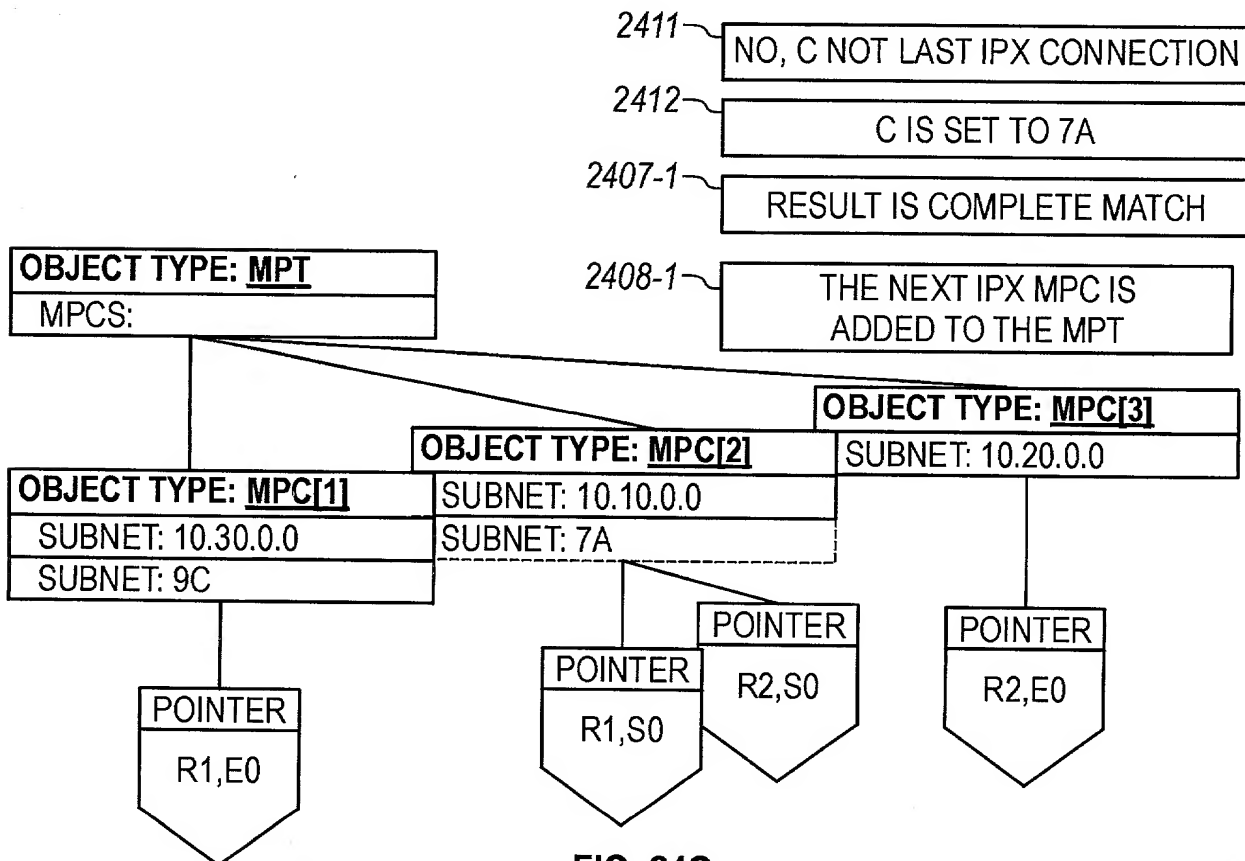


FIG. 24G

202120 50342001

37/104

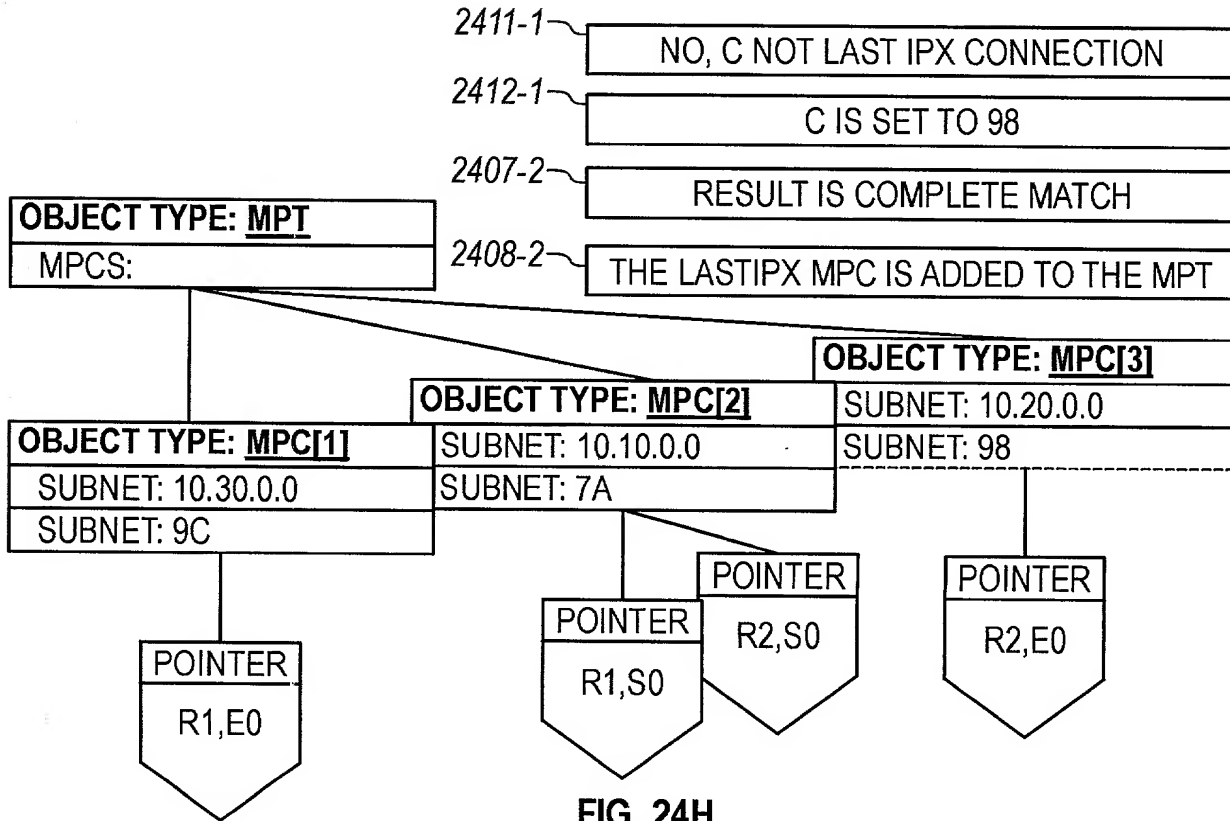


FIG. 24H

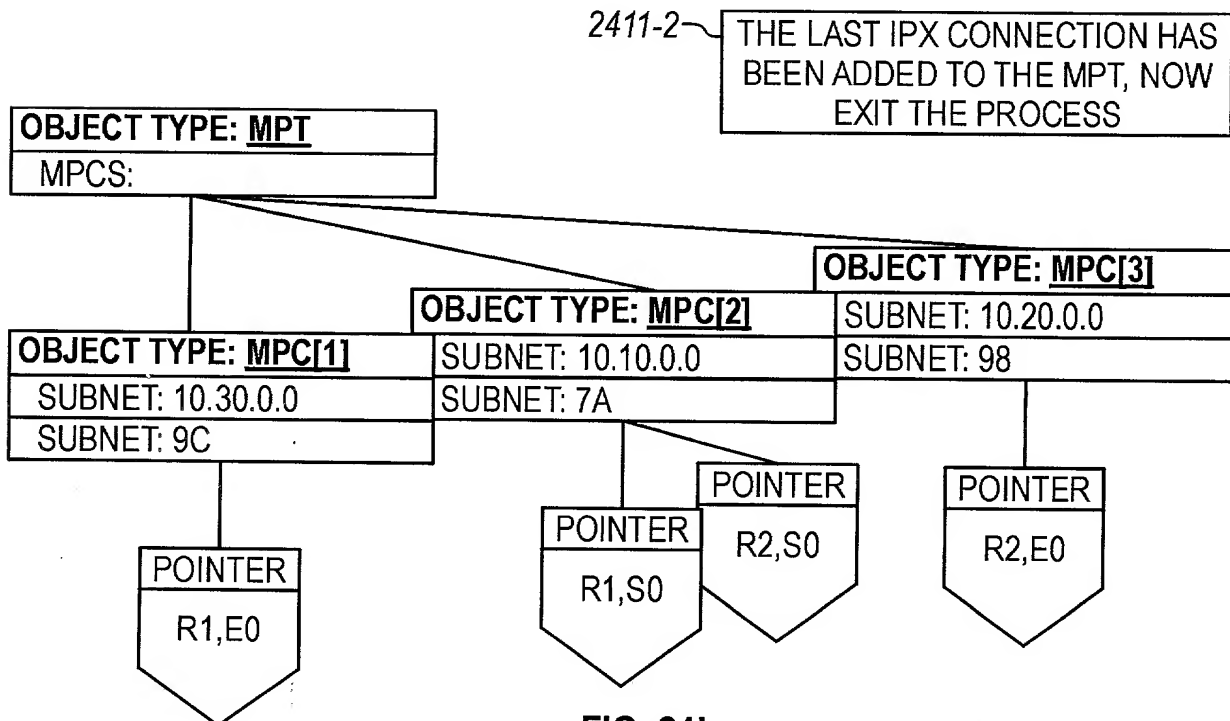


FIG. 24I

38/104

MPT

OBJECT TYPE: <u>MPT</u>
MPCS:

OBJECT TYPE: <u>MPC</u>	SUBNET: 10.10.0.0	OBJECT TYPE: <u>MPC</u>	SUBNET: 10.20.0.0
SUBNET: 10.30.0.0	SUBNET: 7A	SUBNET: 98	
SUBNET: 9C			

SRO

OBJECT TYPE: <u>ROUTER(SRO)</u>
HOSTNAME: R1
PORTS •

PORT [1] E0
MEDIA TYPE: ETHERNET
NUMBER: 0
ENCAPSULATION: ARP
BANDWIDTH: 10000
DELAY: 100
PORT ADDRESSES •

PORT [2] S0
MEDIA TYPE: SERIAL
NUMBER: 0
ENCAPSULATION: HDLC
BANDWIDTH: 1544
DELAY: 2000
PORT ADDRESSES •

PORT_ADDR [1] (R1,E0,IP1)
PROTOCOL: IP
ADDR: 10.30.7.2 255.255.0.0

PORT_ADDR [2] (R1,S0,IP1)
PROTOCOL: IP
ADDR: 10.10.4.1 255.255.0.0

PORT_ADDR [1] (R1,E0,IPX1)
PROTOCOL: IPX
ADDR: 9C

PORT_ADDR [2] (R1,S0,IPX1)
PROTOCOL: IPX
ADDR: 7A

FIG. 25A

20050220 50325-0630

39/104

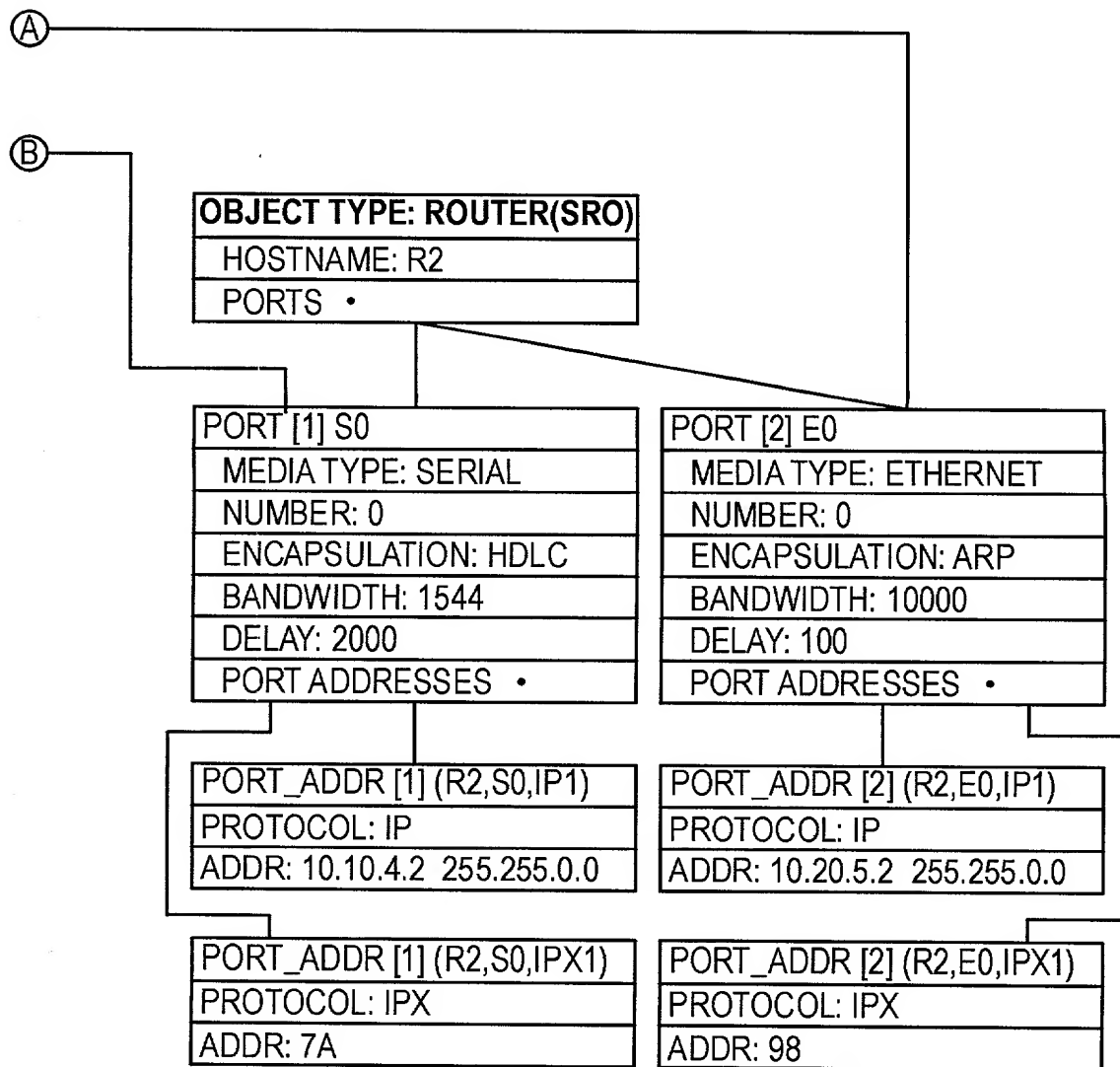


FIG. 25B

40/104

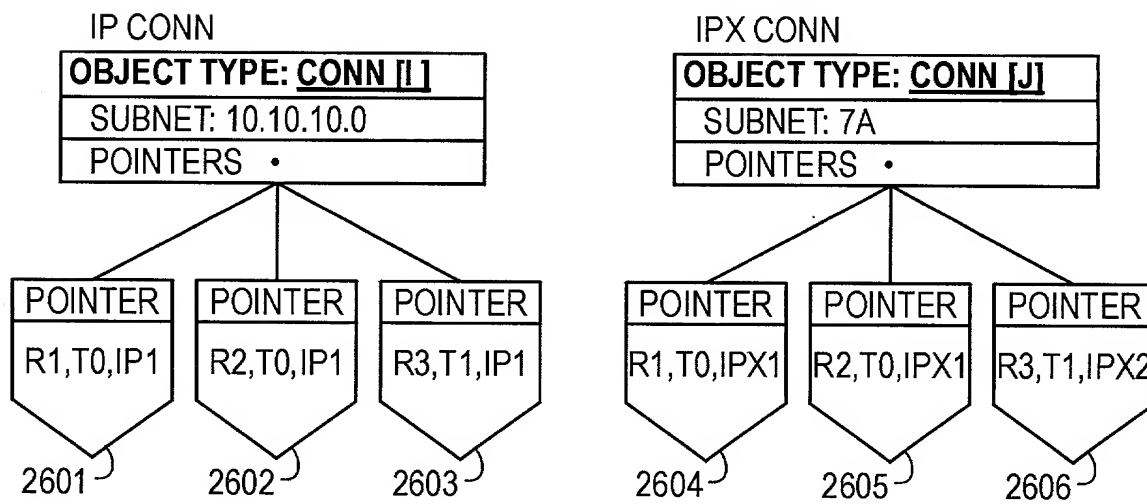
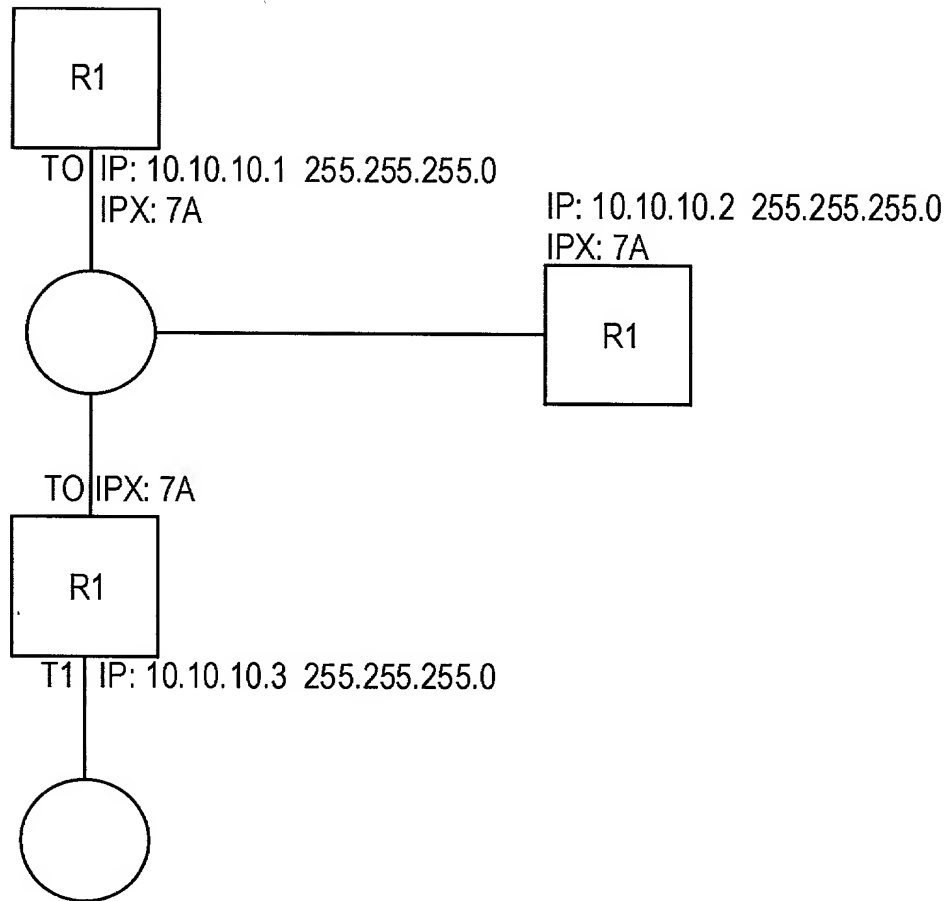


FIG. 26

41/104

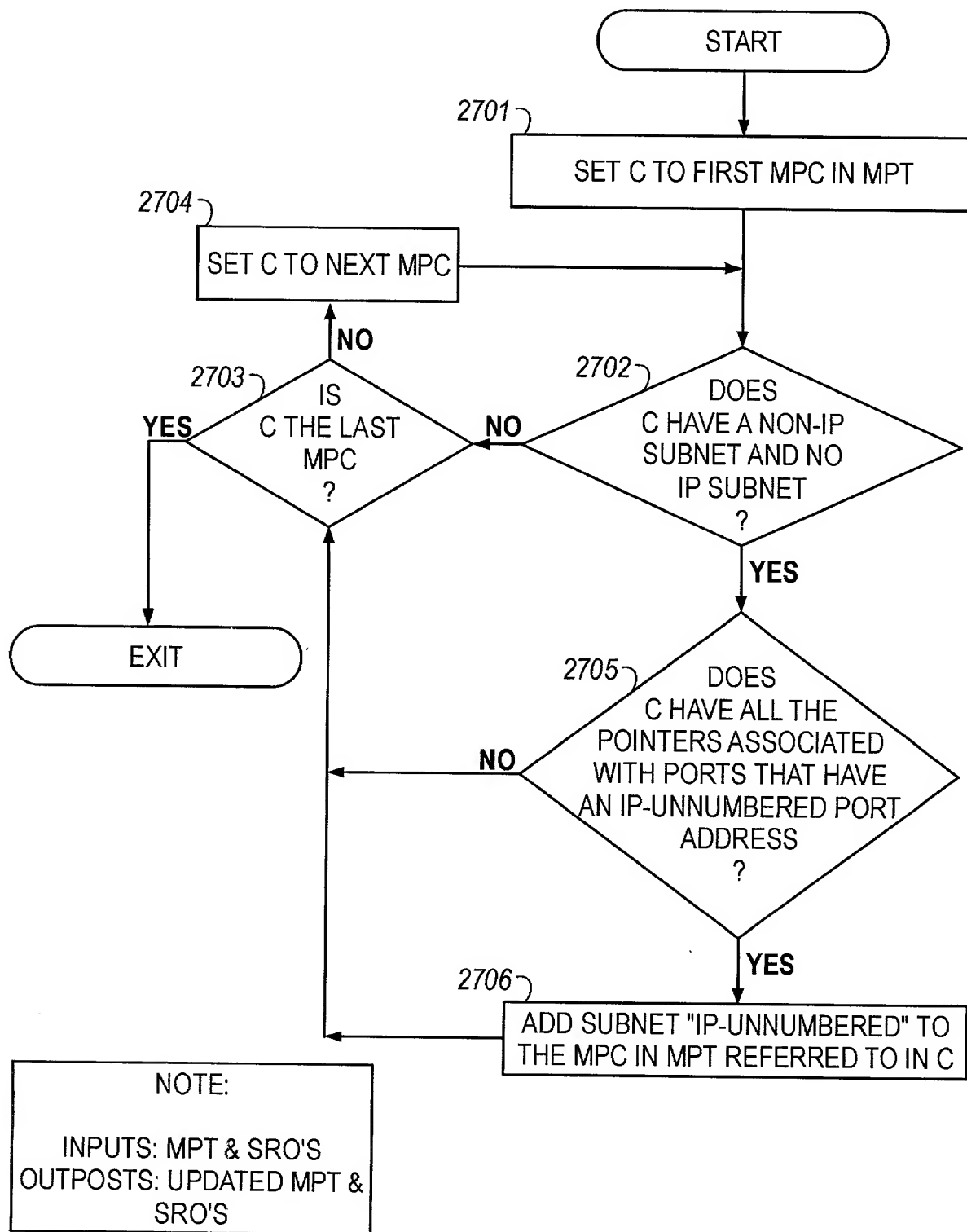


FIG. 27

42/104

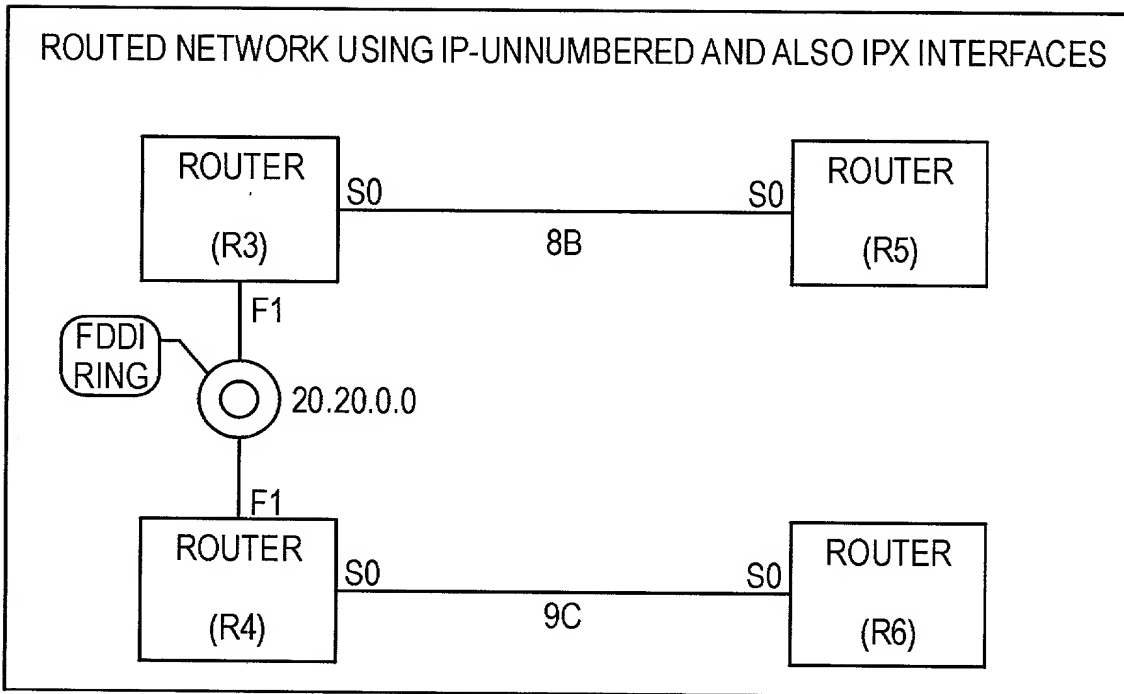


FIG. 28

43/104

ROUTER R3:

2901

```
VERSION 10.0
!
HOSTNAME R3
!
NOVELL ROUTING 0000.0C08.94DD
!
INTERFACE LOOPBACK 1
IP ADDRESS 122.33.2.1 255.255.0.0

INTERFACE SERIAL0
IP-UNNUMBERED LOOPBACK 1
IPX NETWORK 8B
!
INTERFACE FDDI 0
IP ADDRESS 20.20.1.1 255.255.0.0
END
```

FIG. 29A

ROUTER R4:

```
VERSION 10.0
!
HOSTNAME R4
!
NOVELL ROUTING 0000.0C04.3A3E
!
INTERFACE LOOPBACK 1
IP ADDRESS 127.38.7.6 255.255.0.0

INTERFACE SERIAL0
IP-UNNUMBERED LOOPBACK 1
IPX NETWORK 9C
!
INTERFACE FDDI 0
IP ADDRESS 20.20.0.0 255.255.0.0
END
```

FIG. 29B

ROUTER R5:

```
VERSION 10.0
!
HOSTNAME R5
!
NOVELL ROUTING 0000.0D09.A5EE
!
INTERFACE LOOPBACK 1
IP ADDRESS 127.38.7.6 255.255.0.0

INTERFACE SERIAL0
IP-UNNUMBERED LOOPBACK 1
IPX NETWORK 8B
!
END
```

FIG. 29C

ROUTER R6:

```
VERSION 10.0
!
HOSTNAME R6
!
NOVELL ROUTING 0000.0D05.4B4F
!
INTERFACE LOOPBACK 1
IP ADDRESS 132.43.12.11 255.255.0.0

INTERFACE SERIAL0
IP-UNNUMBERED LOOPBACK 1
IPX NETWORK 9C
!
END
```

FIG. 29D

1004485-222

44/104

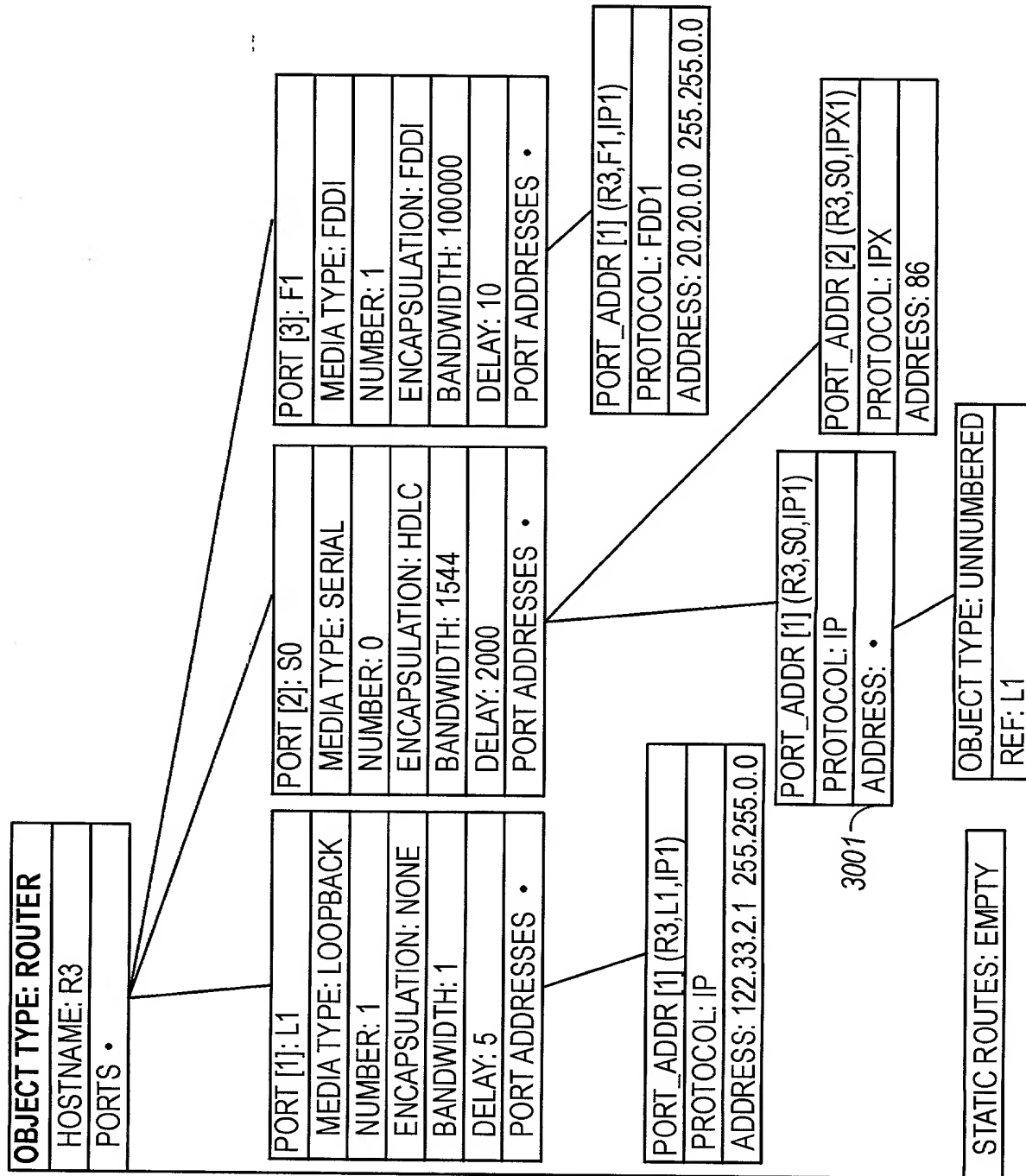


FIG. 30A



FIG. 30B

46/104

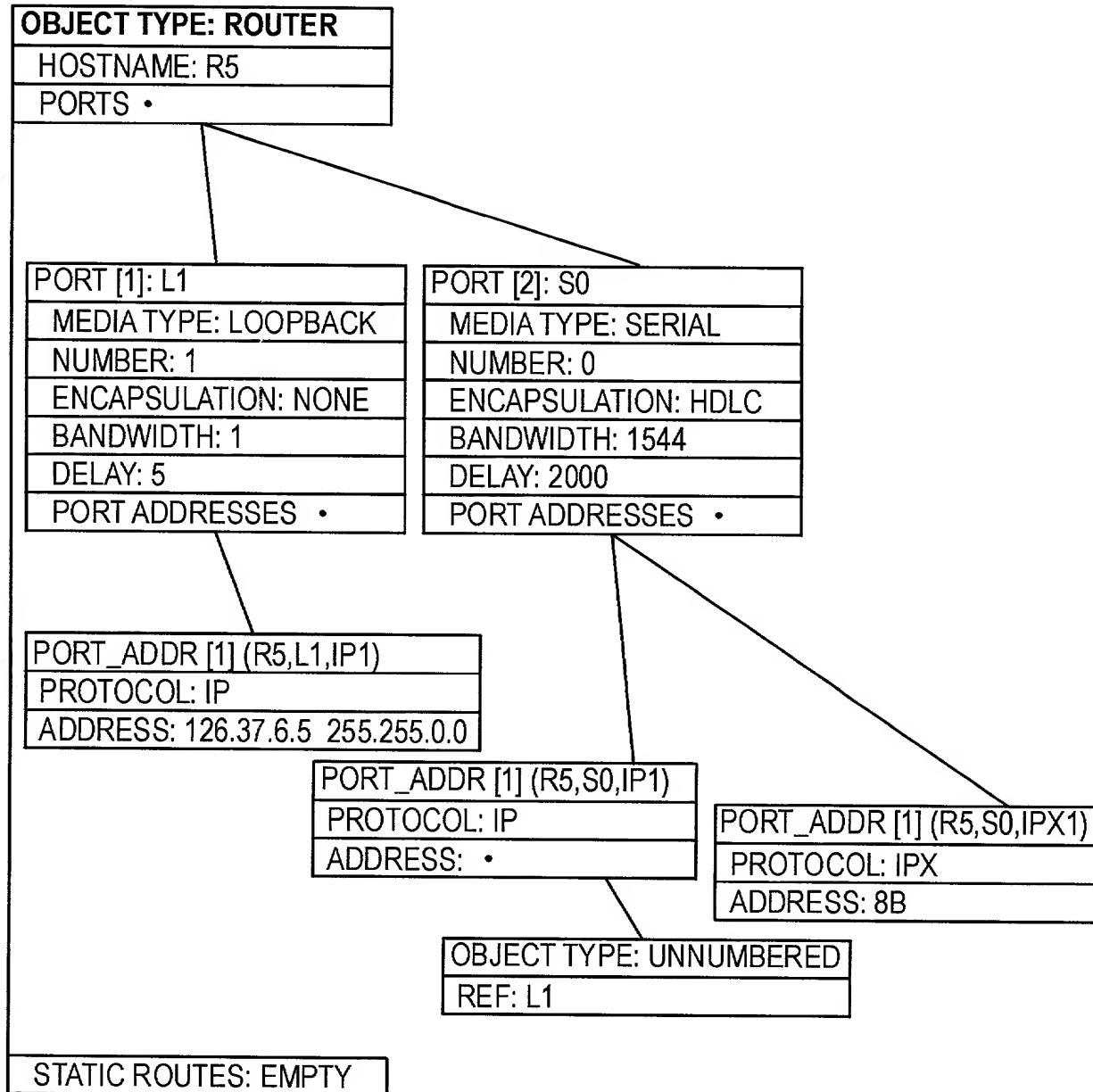


FIG. 30C

47/104

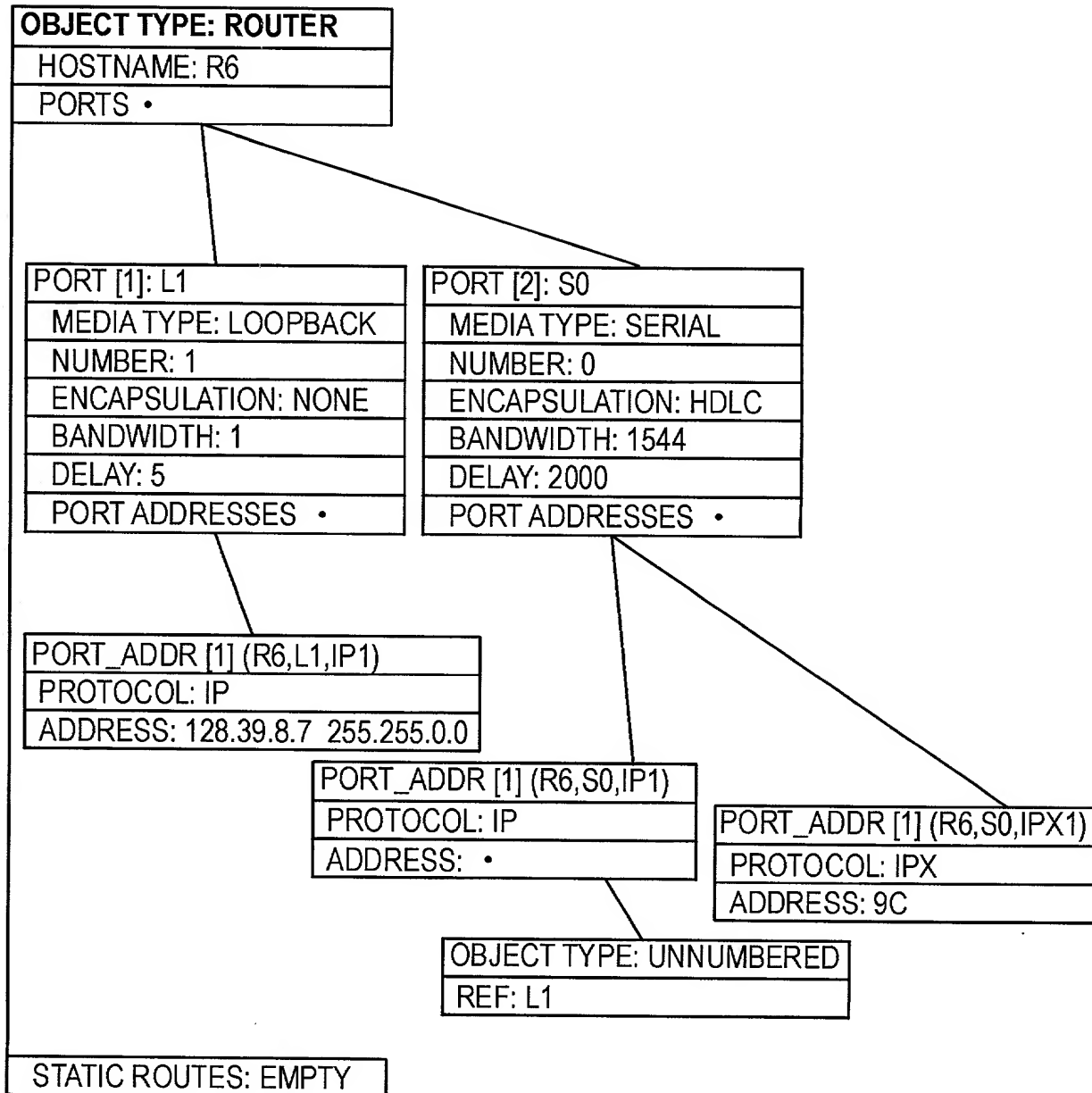


FIG. 30D

48/104

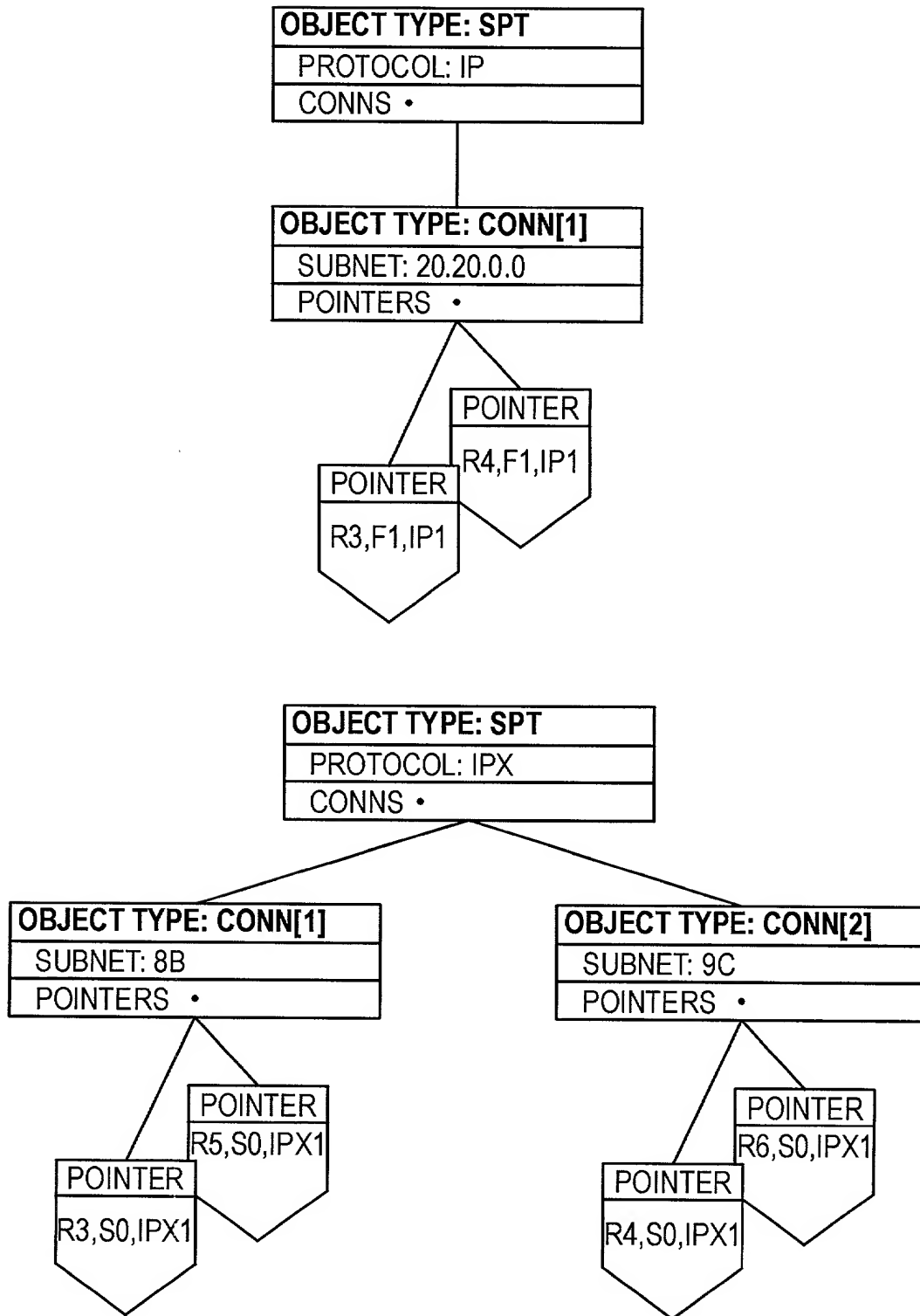


FIG. 30E

49/104

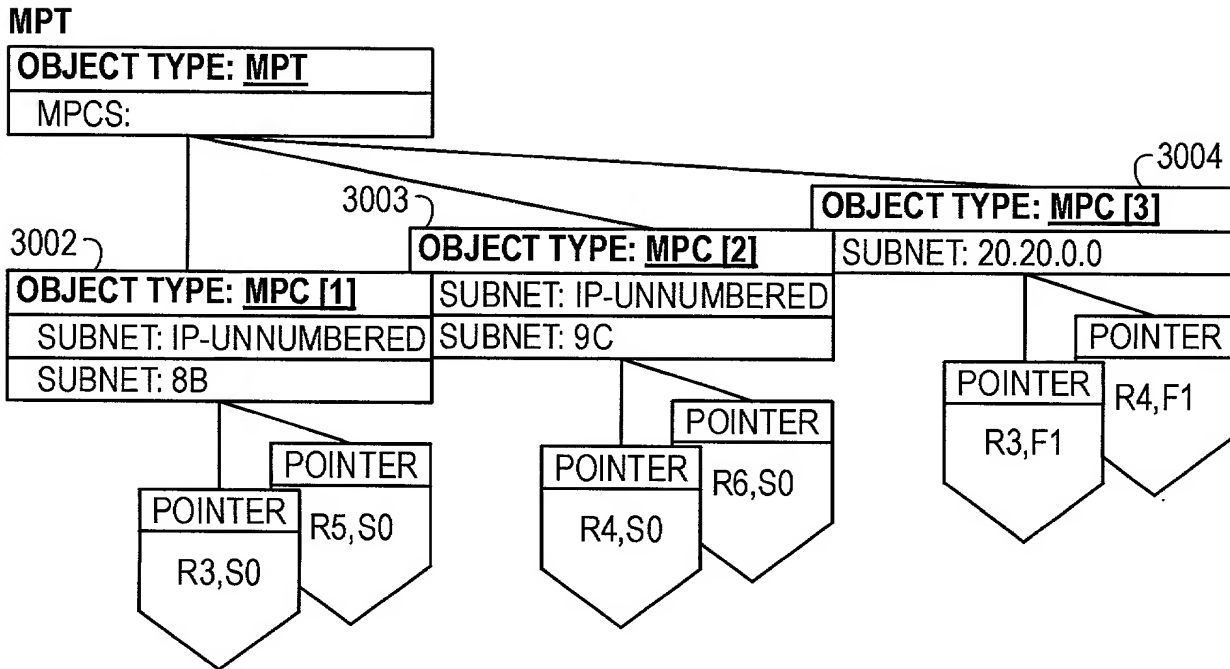


FIG. 30F

50/104

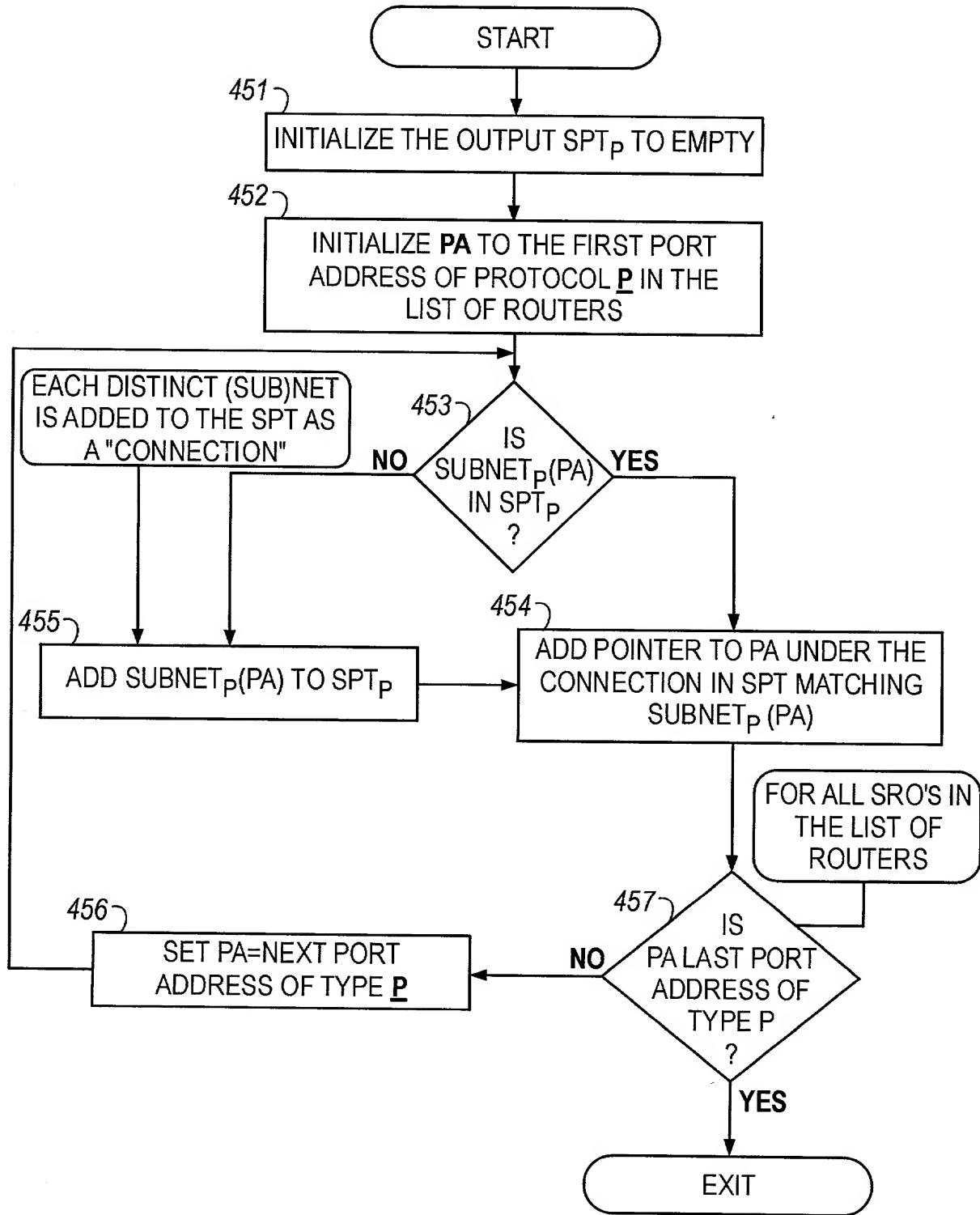


FIG. 31

51/104

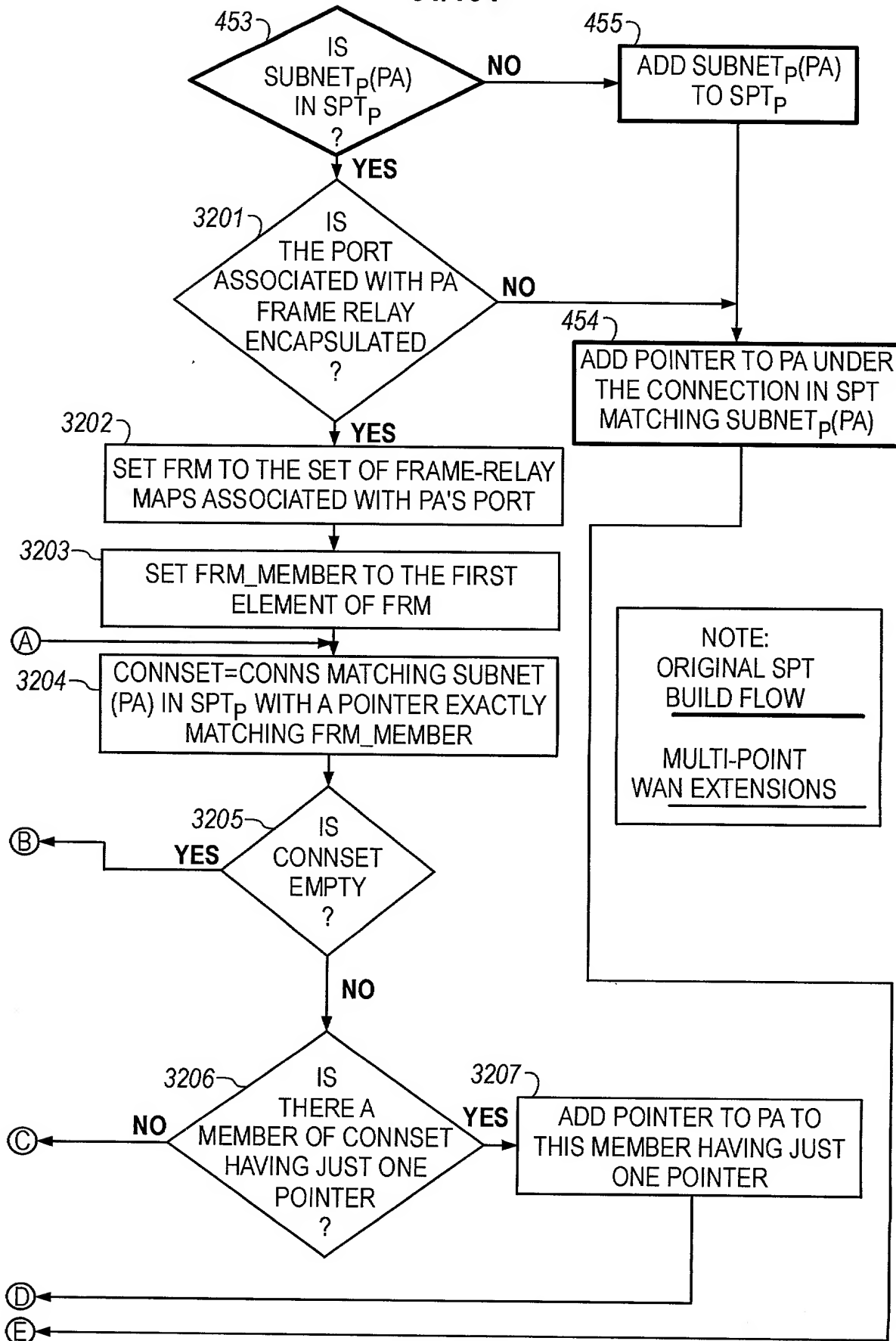


FIG. 32A

2004005 50325-0630

52/104

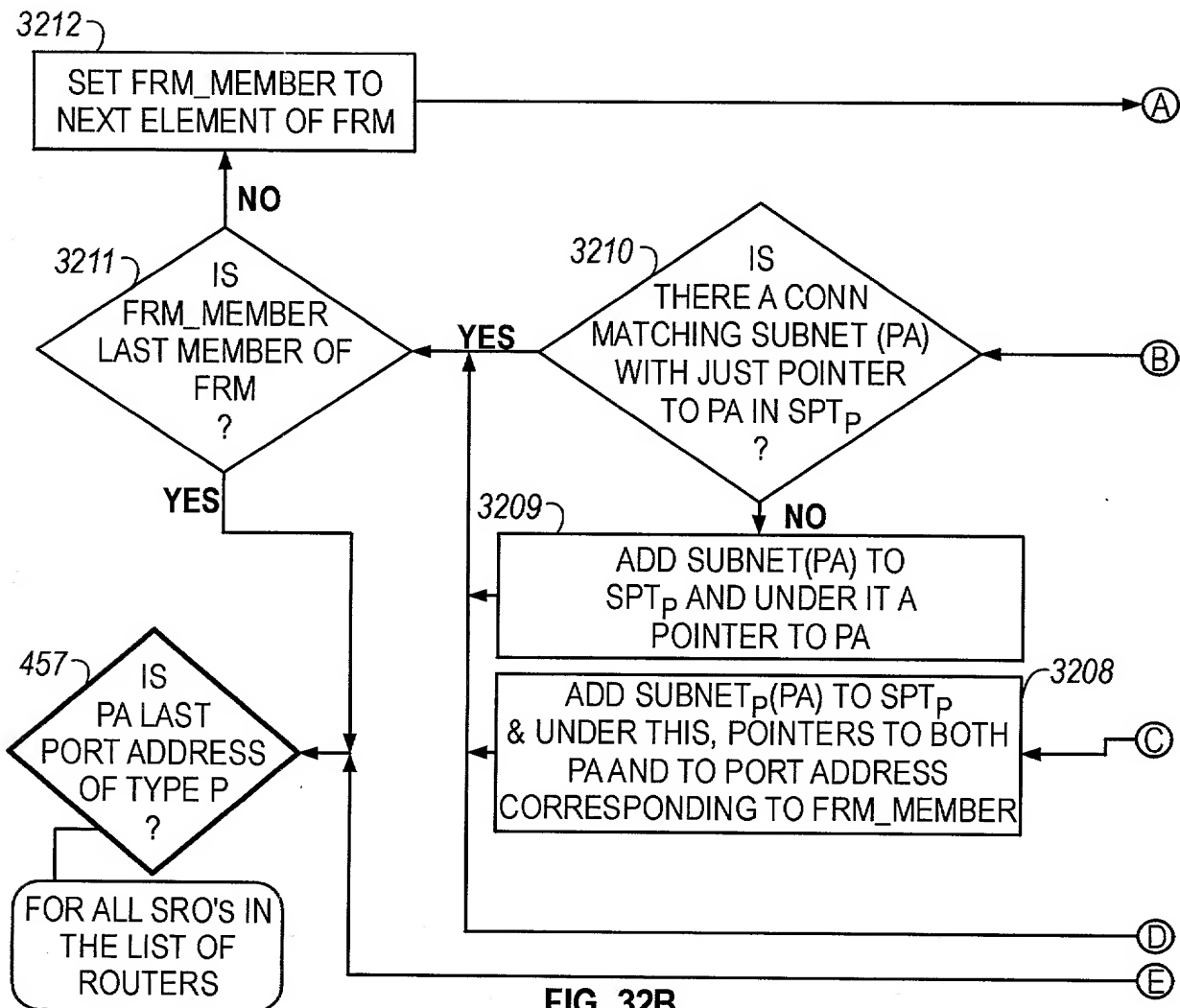


FIG. 32B

53/104

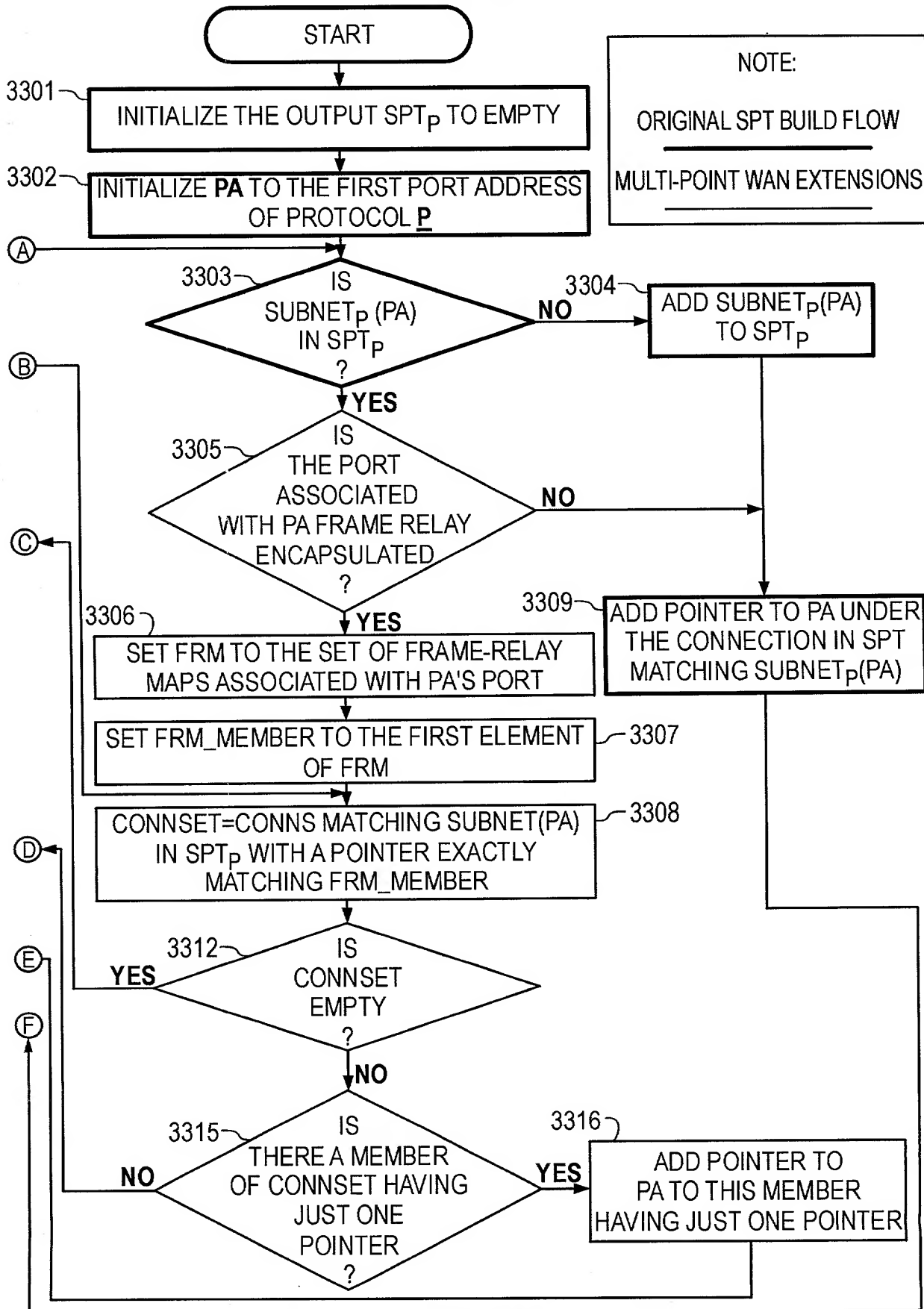
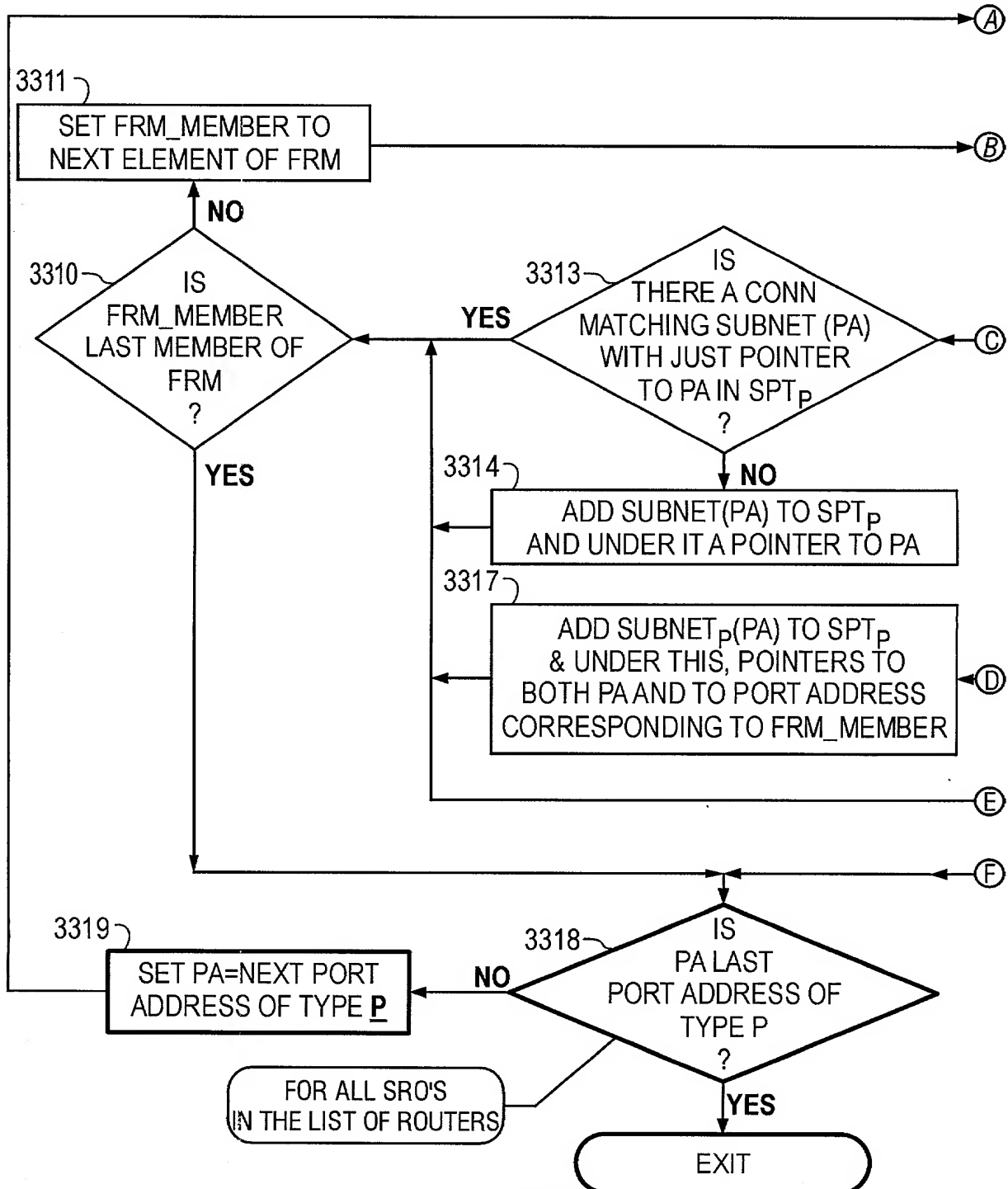


FIG. 33A

54/104



55/104

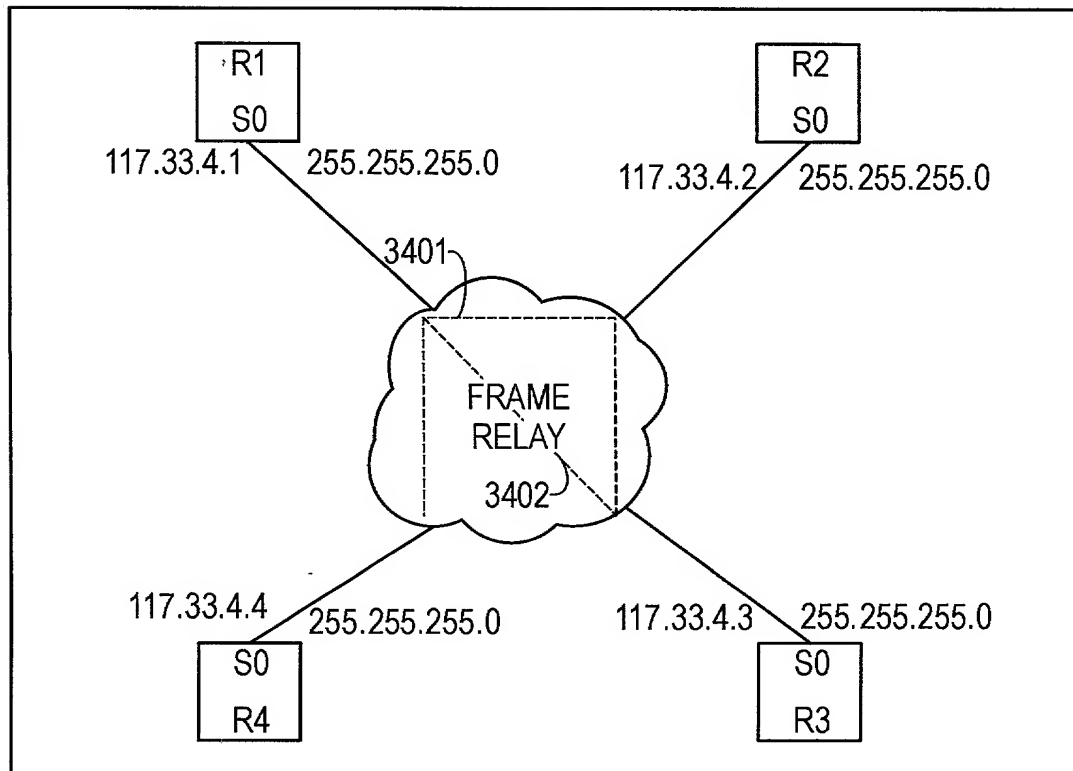


FIG. 34

NOTE TO FIGURE 34

THE NOTION OF A FRAME
RELAY CLOUD IMPLIES FULLY
MESHED CONNECTIVITY, YET
IN ACTUALITY CONNECTIVITY
MAY BE LIMITED AS SHOWN
WITH DOTTED LINES INSIDE
CLOUD

56/104

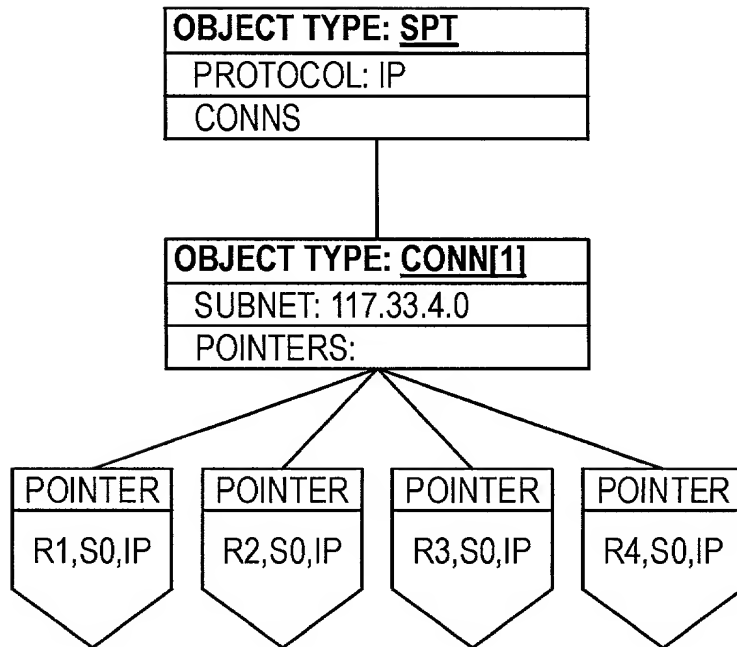


FIG. 35

57/104

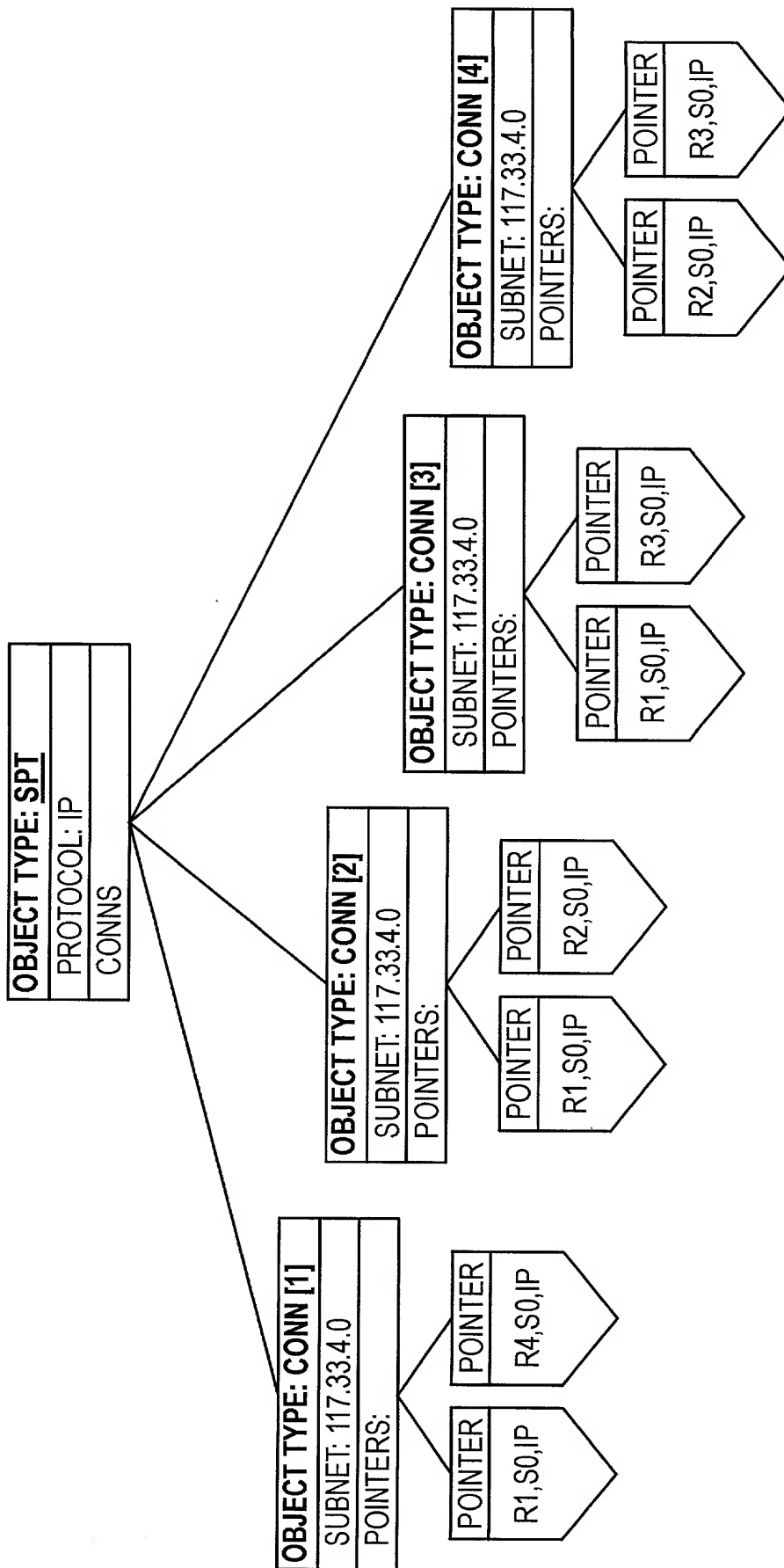


FIG. 36

202120" 50312001

58/104

OBJECT TYPE: ROUTER
HOSTNAME: R1
PORTS •

PORT [1]: S0
MEDIA TYPE: SERIAL
NUMBER: 0
ENCAP: FRAME RELAY
BANDWIDTH: 1544
DELAY: DEFAULT
PORT ADDRESSES:

PORT_ADDR [1] (R1,S0,IP1)
PROTOCOL: IP
ADDRESS: 117.33.4.1 255.255.0.0

FRAME MAPS •

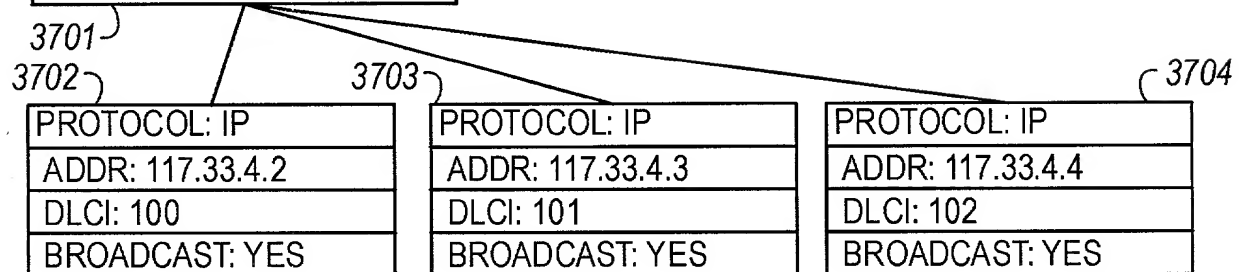


FIG. 37

59/104

3801

```
VERSION 10.0
!
HOSTNAME R1
!
IP SUBNET-ZERO
!
INTERFACE SERIAL0
DESCRIPTION SERIAL 0
ENCAPSULATION FRAME-RELAY
IP ADDRESS 117.33.4.1 255.255.0.0
FRAME RELAY MAP IP 117.33.4.2 100 BROADCAST
FRAME RELAY MAP IP 117.33.4.3 101 BROADCAST
FRAME RELAY MAP IP 117.33.4.4 102 BROADCAST
!
ROUTER RIP 109
NETWORK 117.33.0.0
END
```

FIG. 38A

3803

```
VERSION 10.0
!
HOSTNAME R2
!
IP SUBNET-ZERO
!
INTERFACE SERIAL0
DESCRIPTION SERIAL 0
ENCAPSULATION FRAME-RELAY
IP ADDRESS 117.33.4.1 255.255.0.0
FRAME RELAY MAP IP 117.33.4.1 100 BROADCAST
FRAME RELAY MAP IP 117.33.4.3 101 BROADCAST
!
ROUTER RIP 109
NETWORK 117.33.0.0
END
```

FIG. 38B

2024-05-01 10:43:00

60/104

VERSION 10.0
!
HOSTNAME R3
!
IP SUBNET-ZERO
!
INTERFACE SERIAL0
DESCRIPTION SERIAL 0
ENCAPSULATION FRAME-RELAY
IP ADDRESS 117.33.4.1 255.255.0.0
FRAME RELAY MAP IP 117.33.4.1 100 BROADCAST
FRAME RELAY MAP IP 117.33.4.2 101 BROADCAST
!
ROUTER RIP 109
NETWORK 117.33.0.0
END

FIG. 38C

VERSION 10.0
!
HOSTNAME R4
!
IP SUBNET-ZERO
!
INTERFACE SERIAL0
DESCRIPTION SERIAL 0
ENCAPSULATION FRAME-RELAY
IP ADDRESS 117.33.4.1 255.255.0.0
FRAME RELAY MAP IP 117.33.4.1 100 BROADCAST
!
ROUTER RIP 109
NETWORK 117.33.0.0
END

FIG. 38D

202120-50842001

61/104

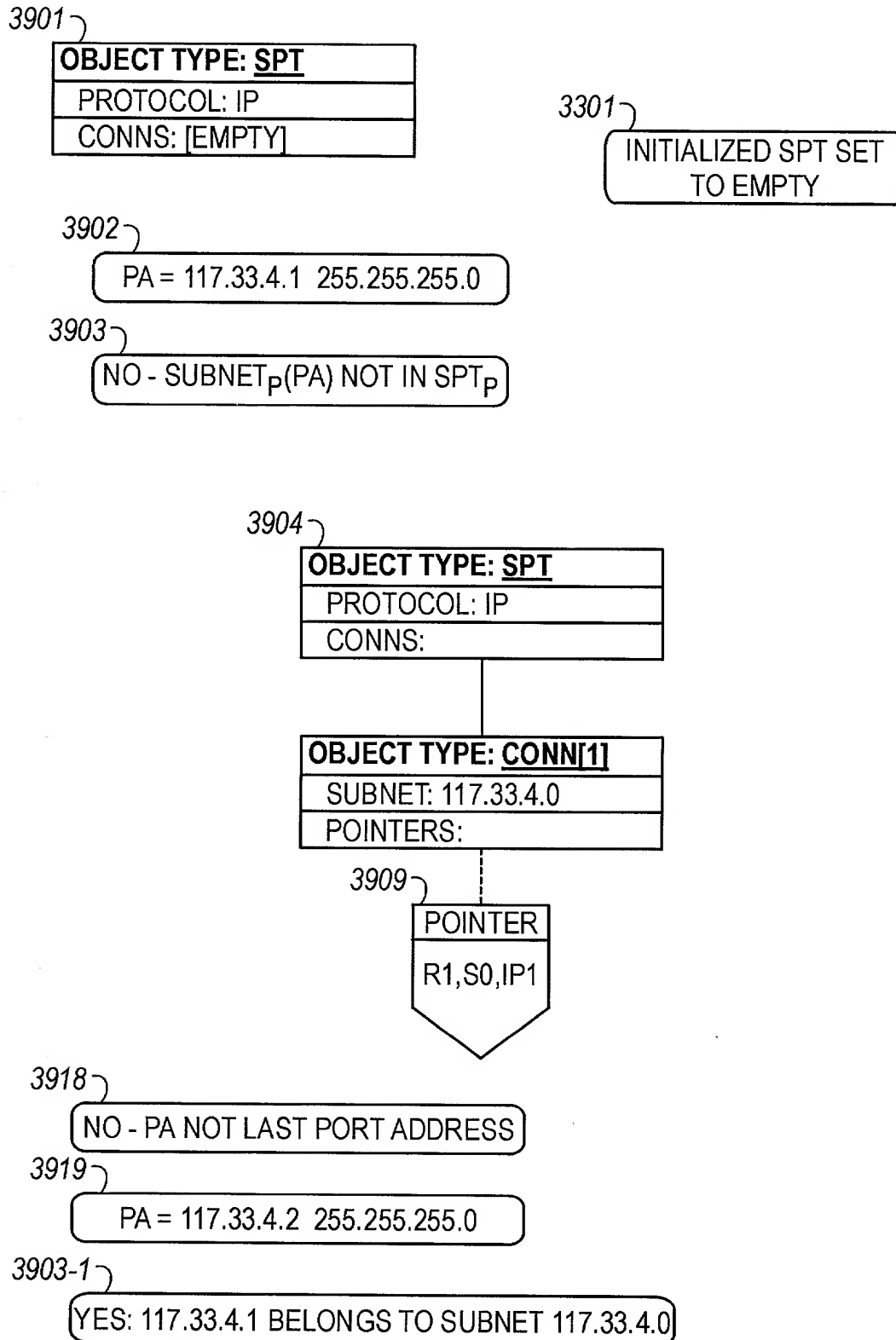


FIG. 39A

62/104

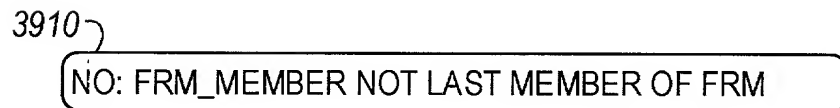
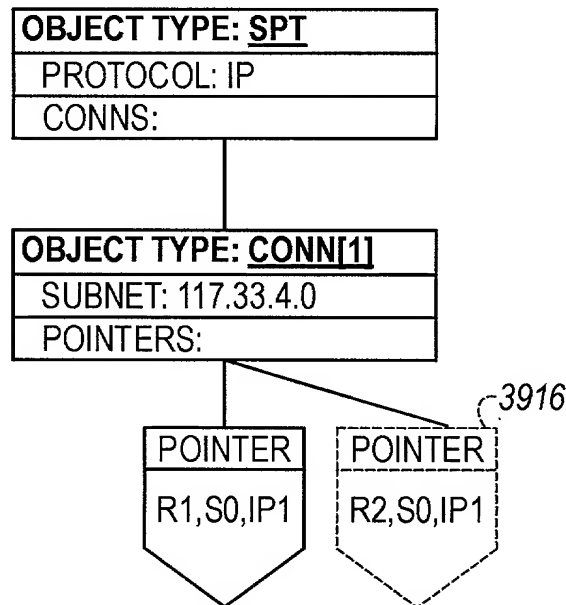
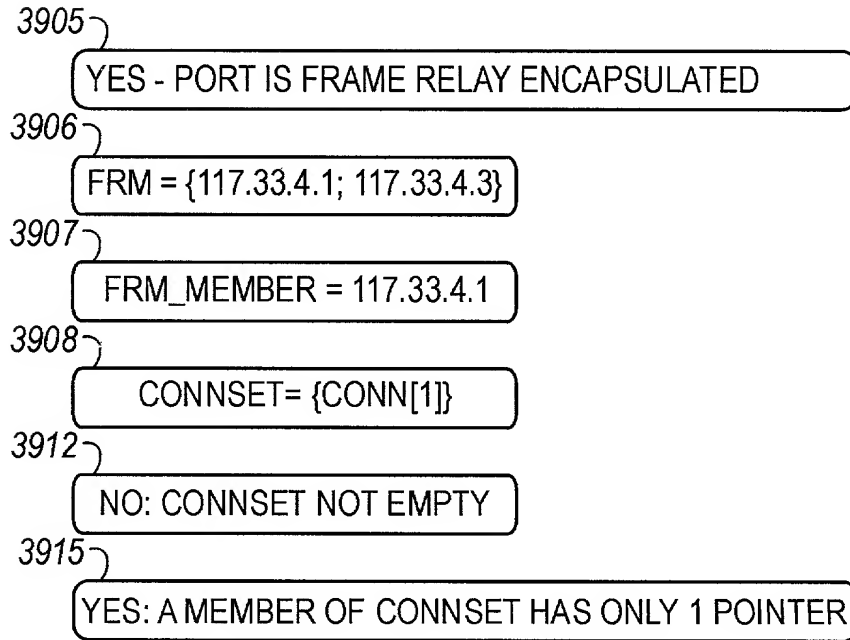


FIG. 39B

63/104

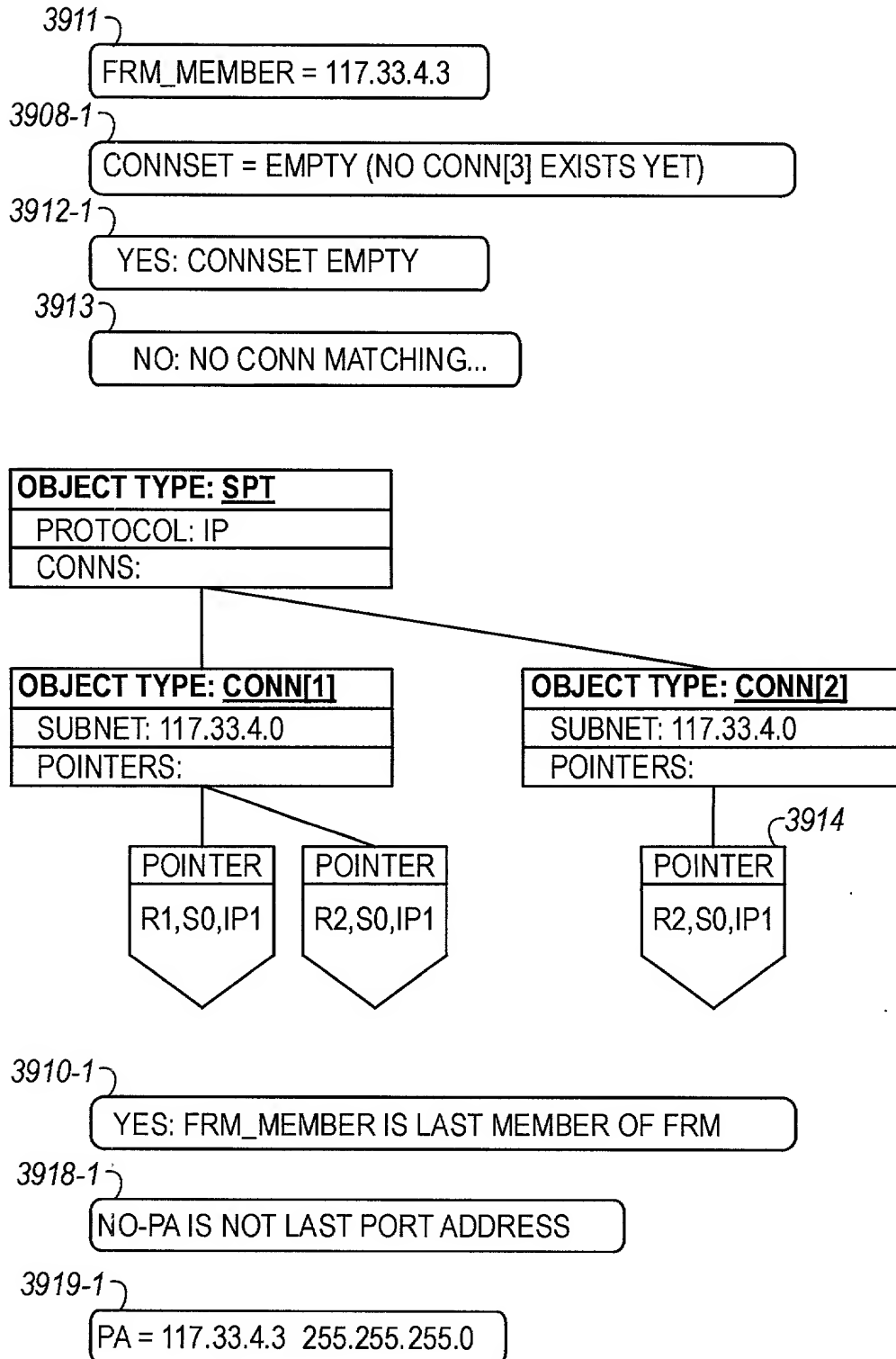


FIG. 39C

202120 50342001

64/104

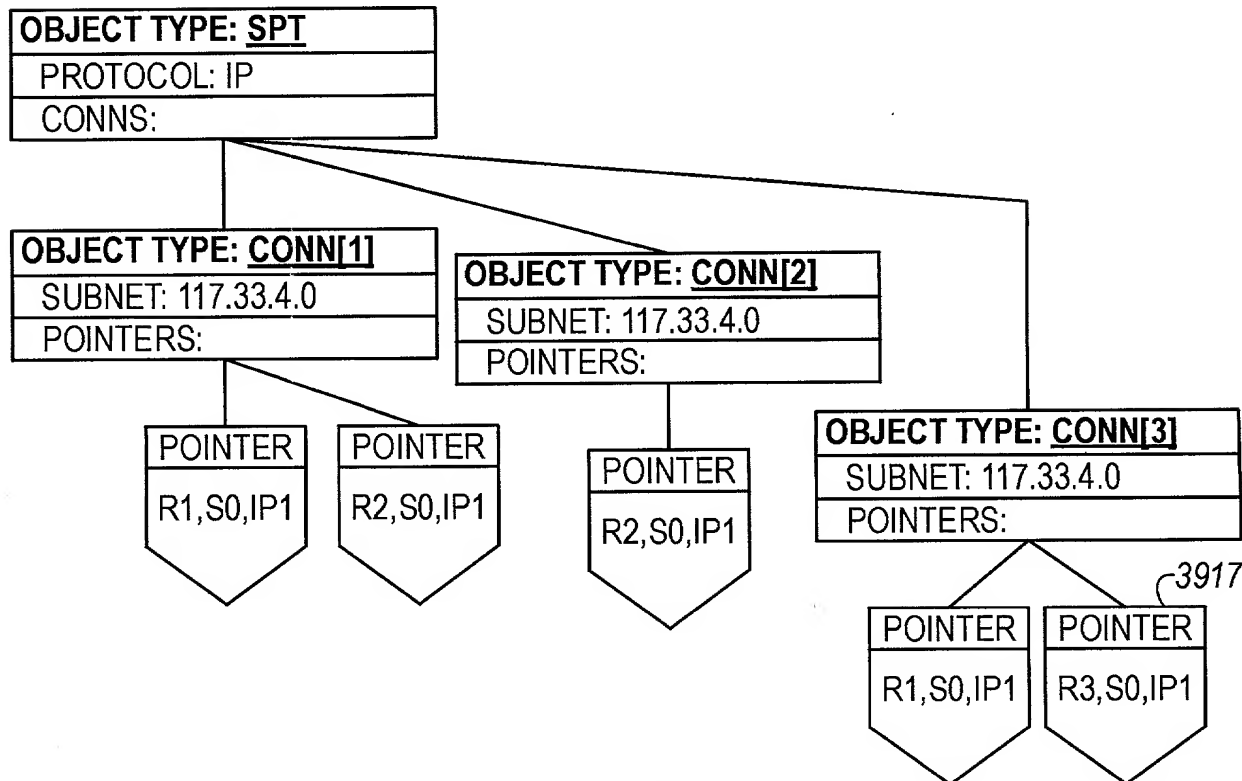
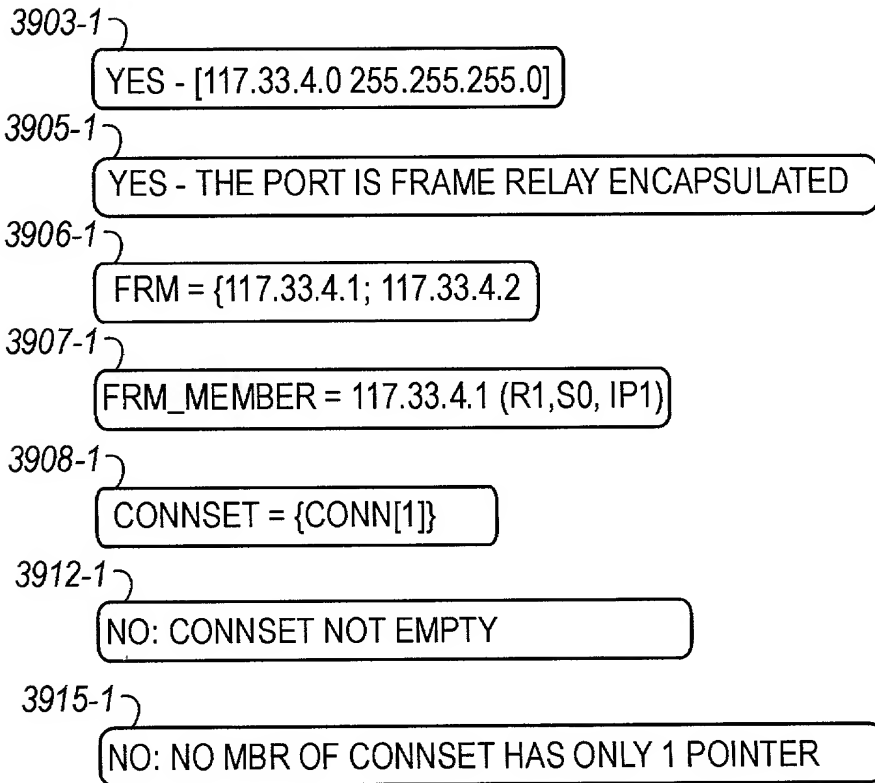


FIG. 39D

202120" 5084/001

65/104

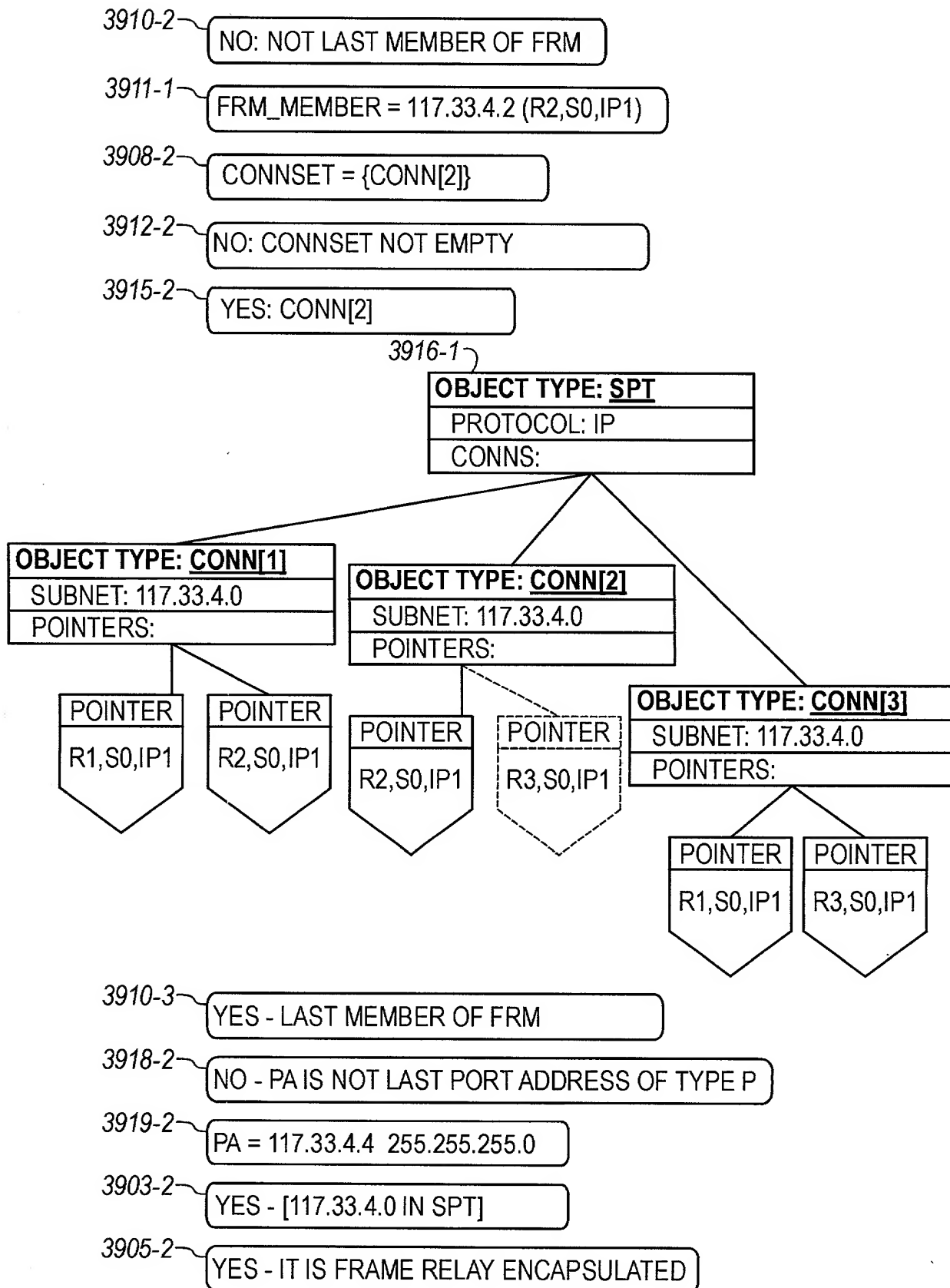


FIG. 39E

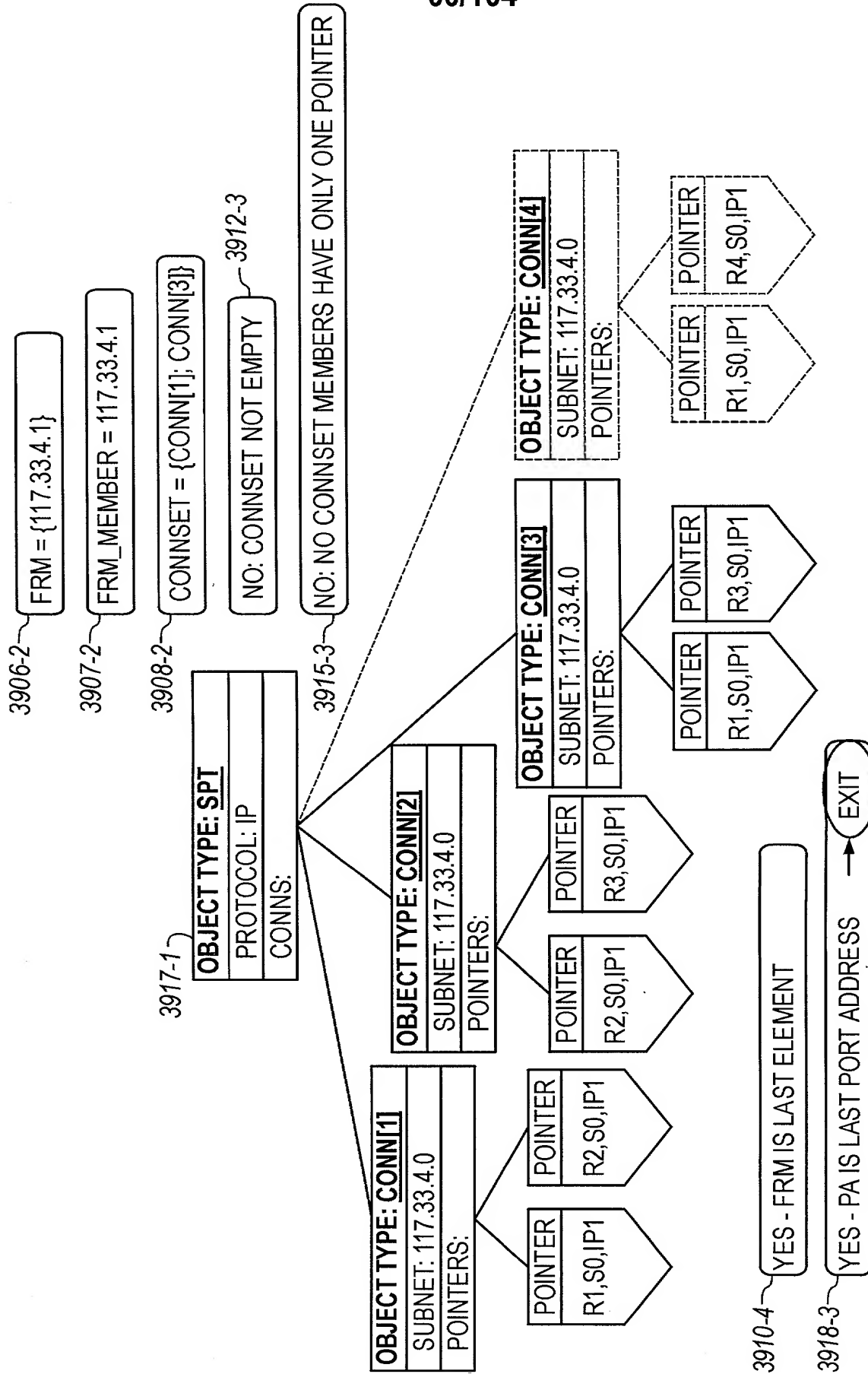
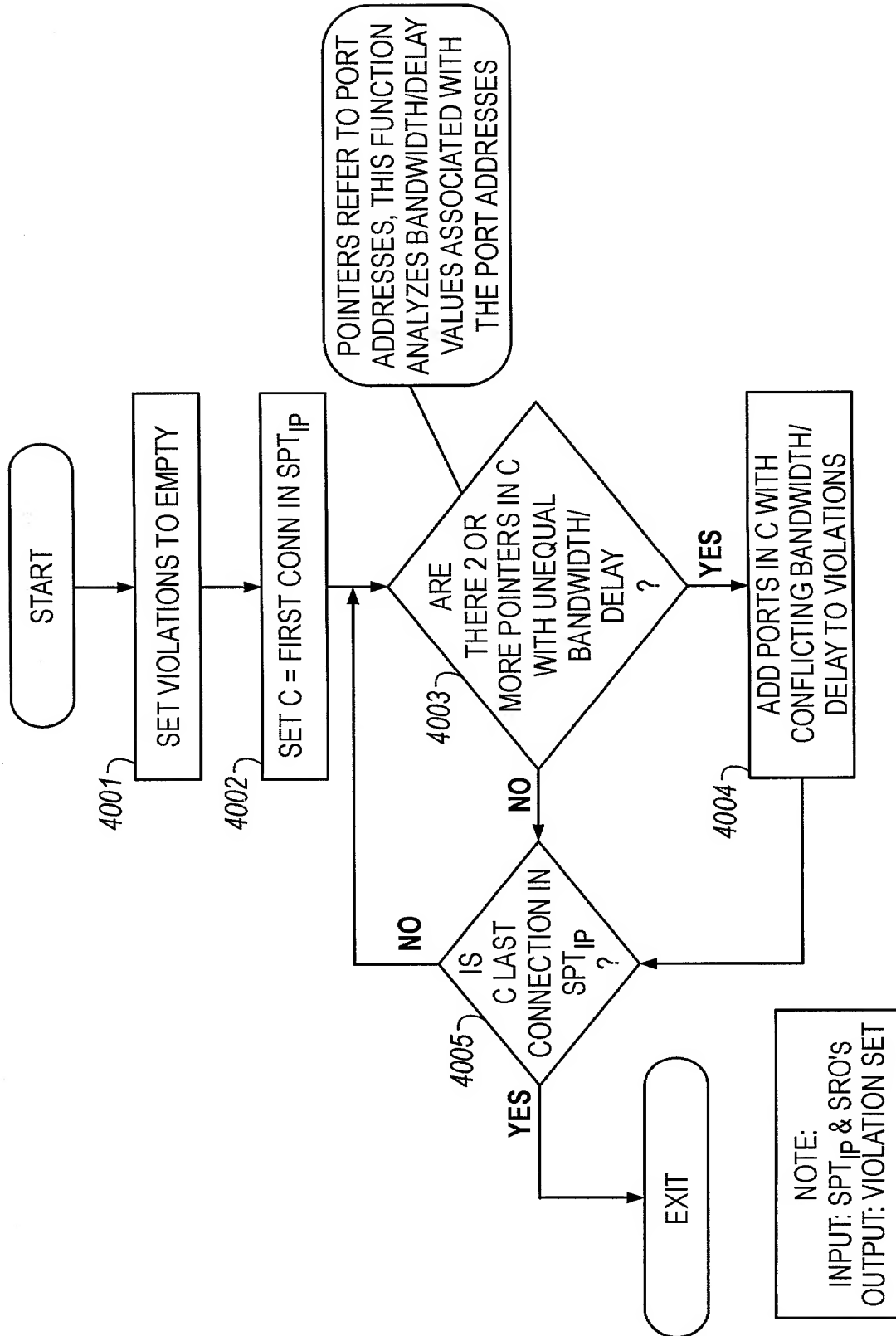


FIG. 39F

67/104



68/104

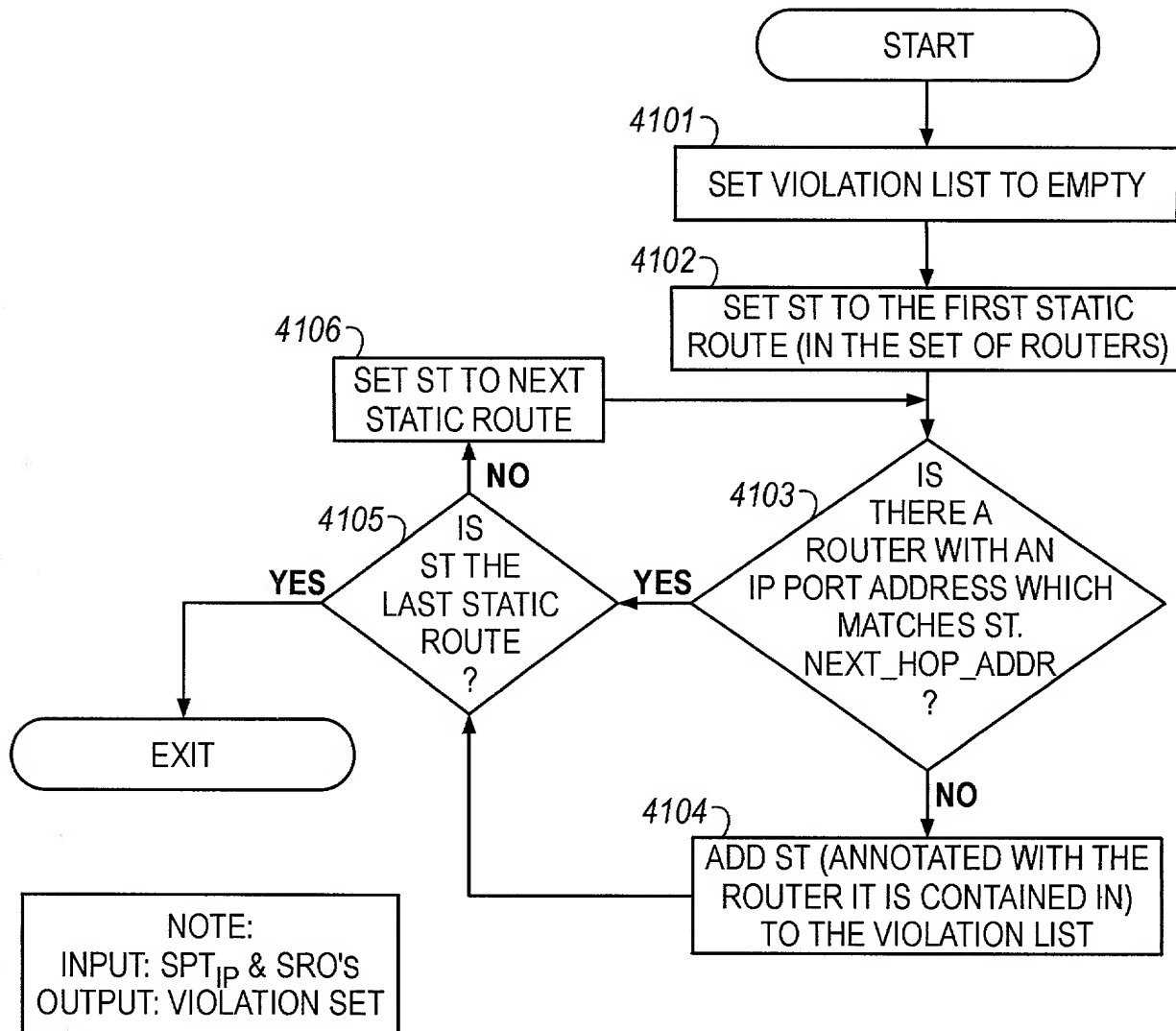


FIG. 41

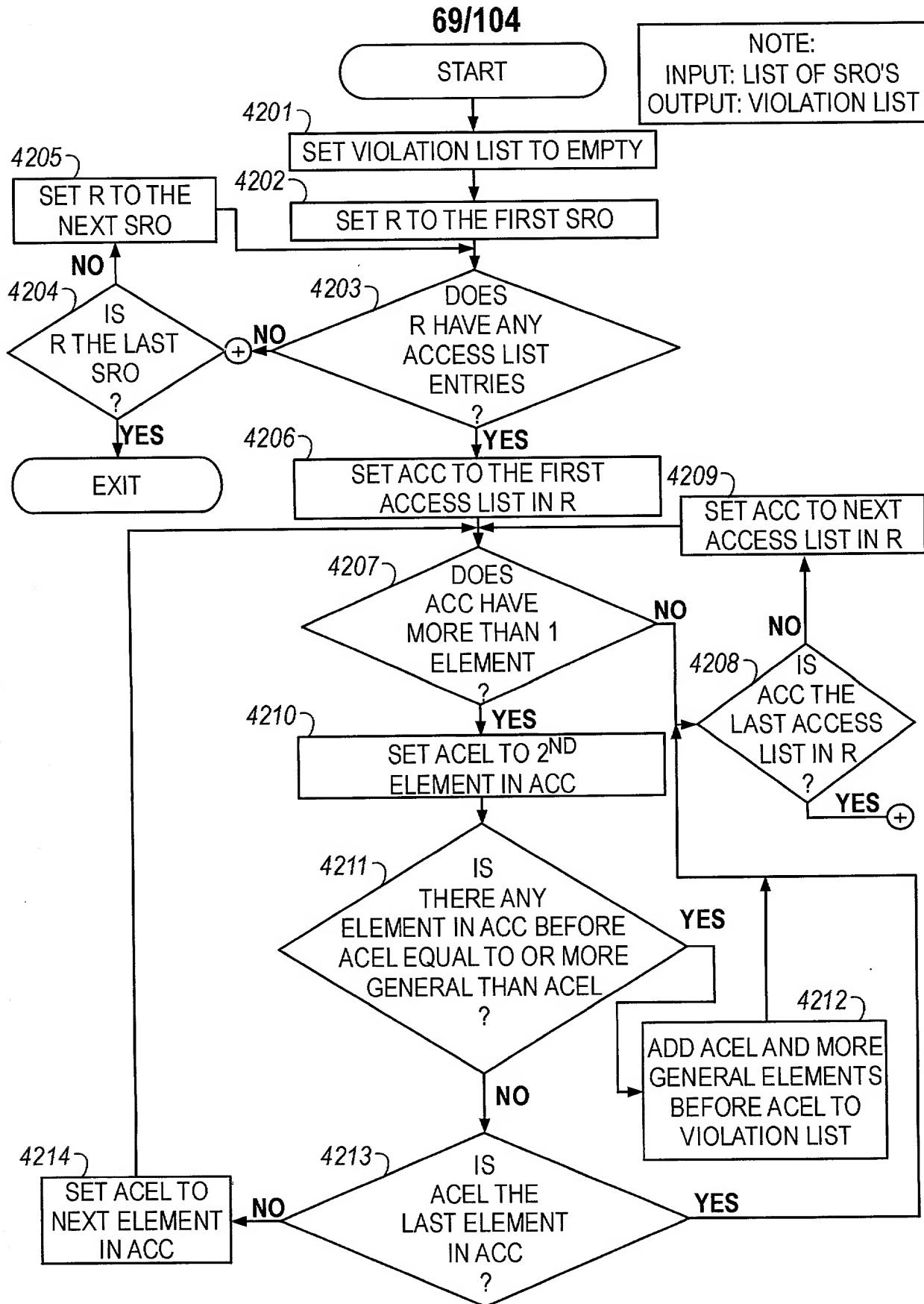


FIG. 42

70/104

INPUTS: SPT_p AND THE SRO'S IT
 POINTS TO, AND THE OPERATIONAL
 STATUS FOR EACH ROUTER, ROUTER
 PORT AND CONNECTION
 OUTPUTS: ROUTING TABLES FOR
 $PROTOCOL_p$ FOR EACH ROUTER

START

4301

FOR EACH ROUTER (IN THE SET OF SRO'S) INITIALIZE ITS
 ROUTING TABLE (FOR $PROTOCOL_p$) TO EMPTY

4302

FOR EACH ROUTER THAT HAS OPERATIONAL STATUS,
 PUT IN A ROUTING TABLE ELEMENT FOR EACH OF ITS
 PORT ADDRESSES (FOR $PROTOCOL_p$) AND STATIC
 ROUTES ASSOCIATED WITH PORTS IN OPERATIONAL STATUS

4303

FOR EACH OPERATIONAL ROUTER, RO , FOR EACH OF RO 'S PORTS PO , THAT
 IS OPERATIONAL AND FOR EACH OF RO 'S ROUTING PROTOCOLS (FOR P) AN
 UPDATE MESSAGE WILL BE DELIVERED TO THE CONNECTION ASSOCIATED
 WITH PO IF IT IS NOT EMPTY; THE UPDATE MESSAGE WILL CONSIST OF
 $\{RT_EL \mid RT_EL = SEND(RT_EL_IN_TABLE, RP, \langle RO, PO \rangle \text{ WHERE } RT_EL_IN_TABLE$
 IS A ROUTING TABLE ELEMENT IN RO 'S ROUTING TABLE}

4304

FOR EACH CONNECTION (IN SPT_p) THAT RECEIVES AN UPDATE MESSAGE
 FROM ROUTER RO , PORT PO , IF IT IS OPERATIONAL, THEN THE UPDATE
 WILL BE PASSED TO ALL THE ROUTER PORTS IT IS POINTING TO EXCEPT
 FOR RO, PO : IF THE CONNECTION IS NOT OPERATIONAL ALL UPDATE
 MESSAGES ARE DROPPED

4305

FOR EACH OPERATIONAL ROUTER RO AND EACH UPDATE UPD THAT IT
 RECEIVES THROUGH PORT PO , IF PO IS OPERATIONAL, THE SET UPD_TO_PROC
 WILL BE FORMED; IF PO IS NOT OPERATIONAL, UPD IS DROPPED; UPD_TO_PROC
 IS DEFINED AS THE SET: $\{RT_EL \mid RT_EL = RECEIVE(RT_EL_UPD, RP, \langle RO, PO \rangle$
 WHERE RT_EL_UPD IS A MEMBER OF UPD , AND RT_EL 'S DESTINATION IS NOT
 IN RO 'S ROUTING TABLE, OR IF IT IS THEN IT EITHER HAS A BETTER COST/ADMIN
 DISTANCE OR AN EQUAL COST/ADMIN DISTANCE, BUT NOT AN EXACT MATCH}

A

B

FIG. 43A

2021-01-20 15:03:42

71/104

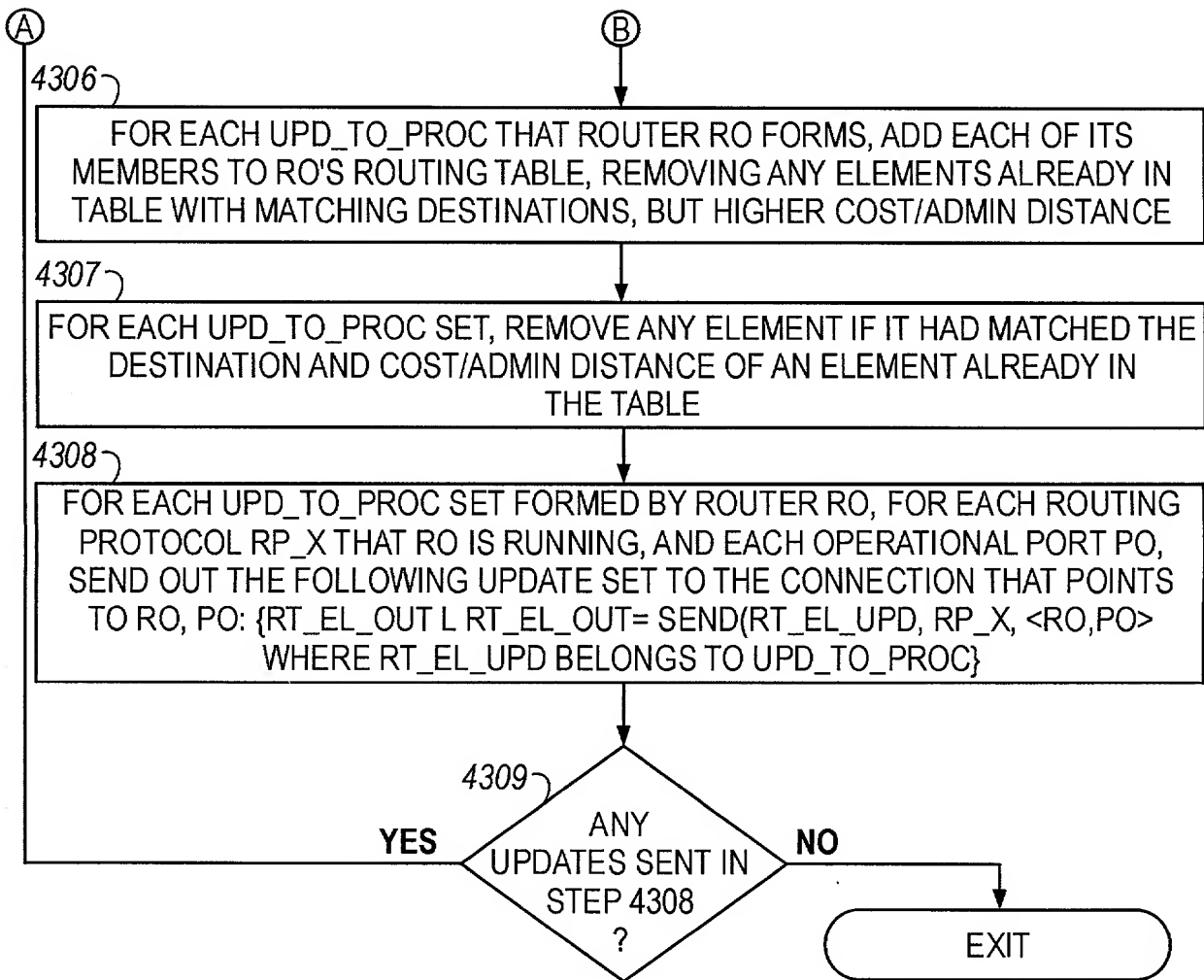


FIG. 43B

72/104

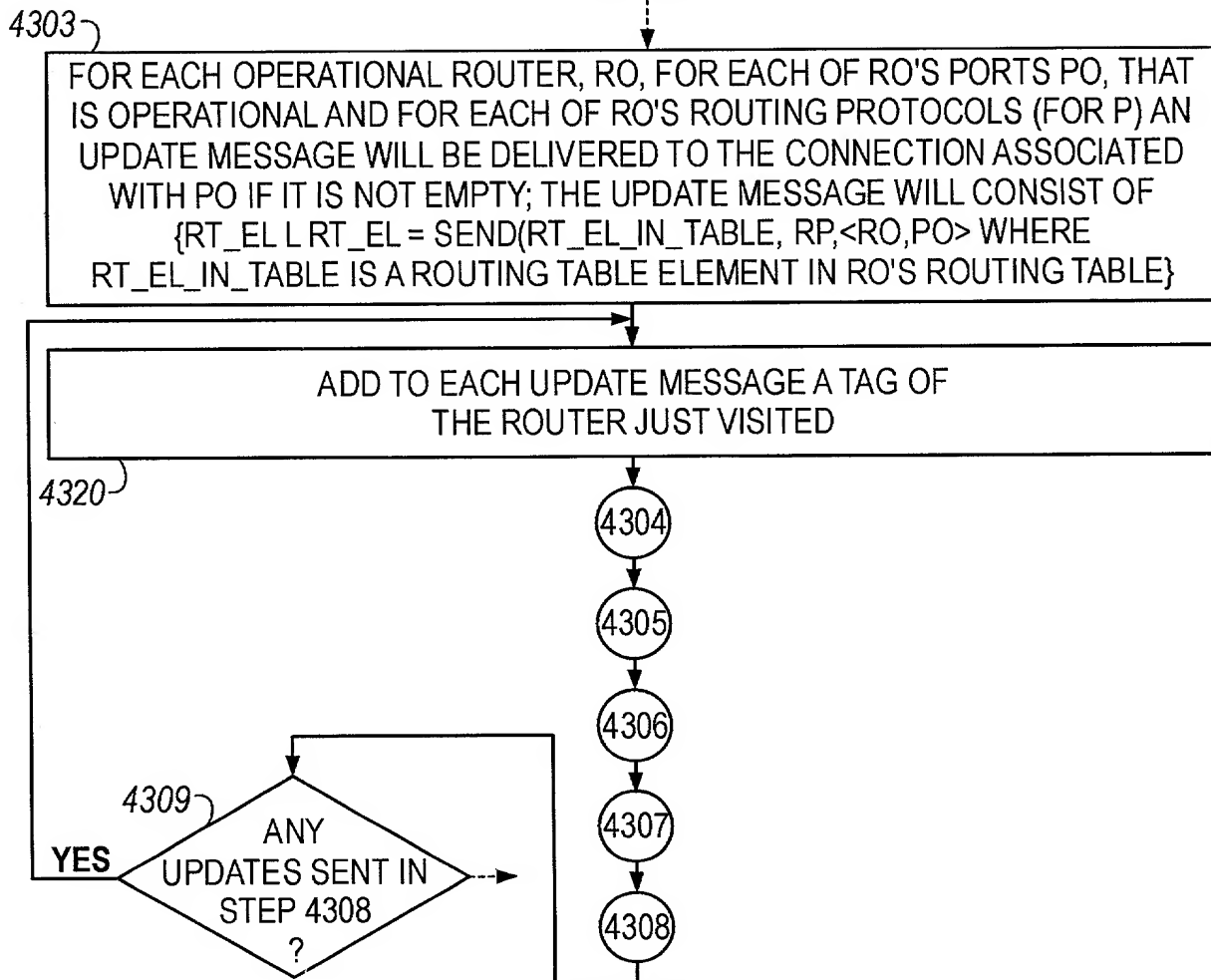


FIG. 43C

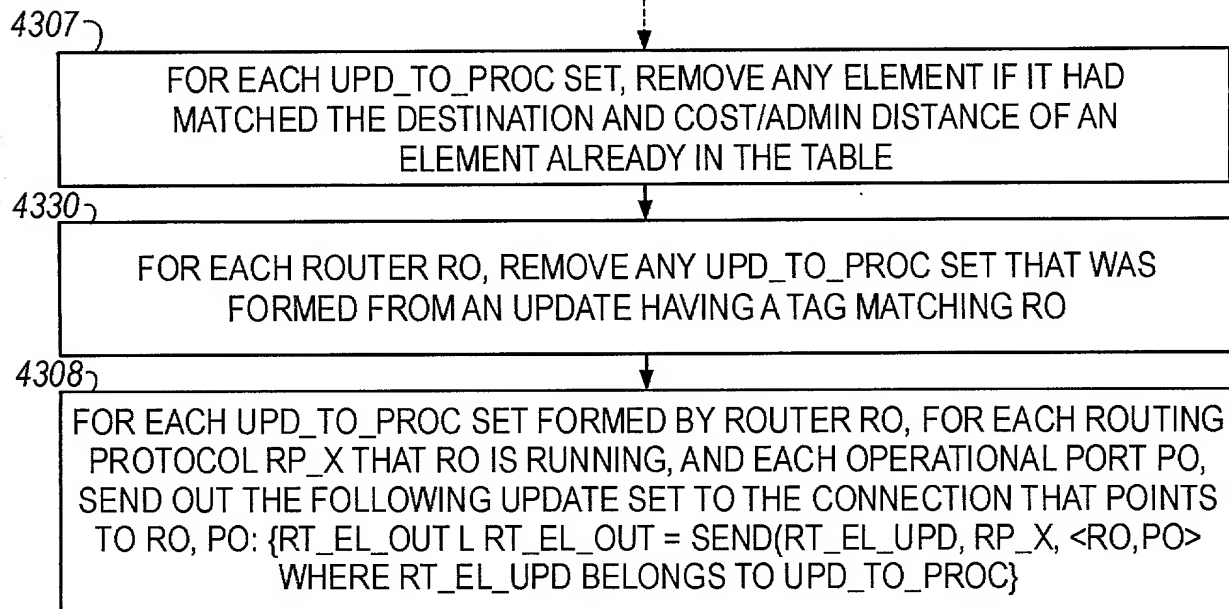


FIG. 43D

73/104

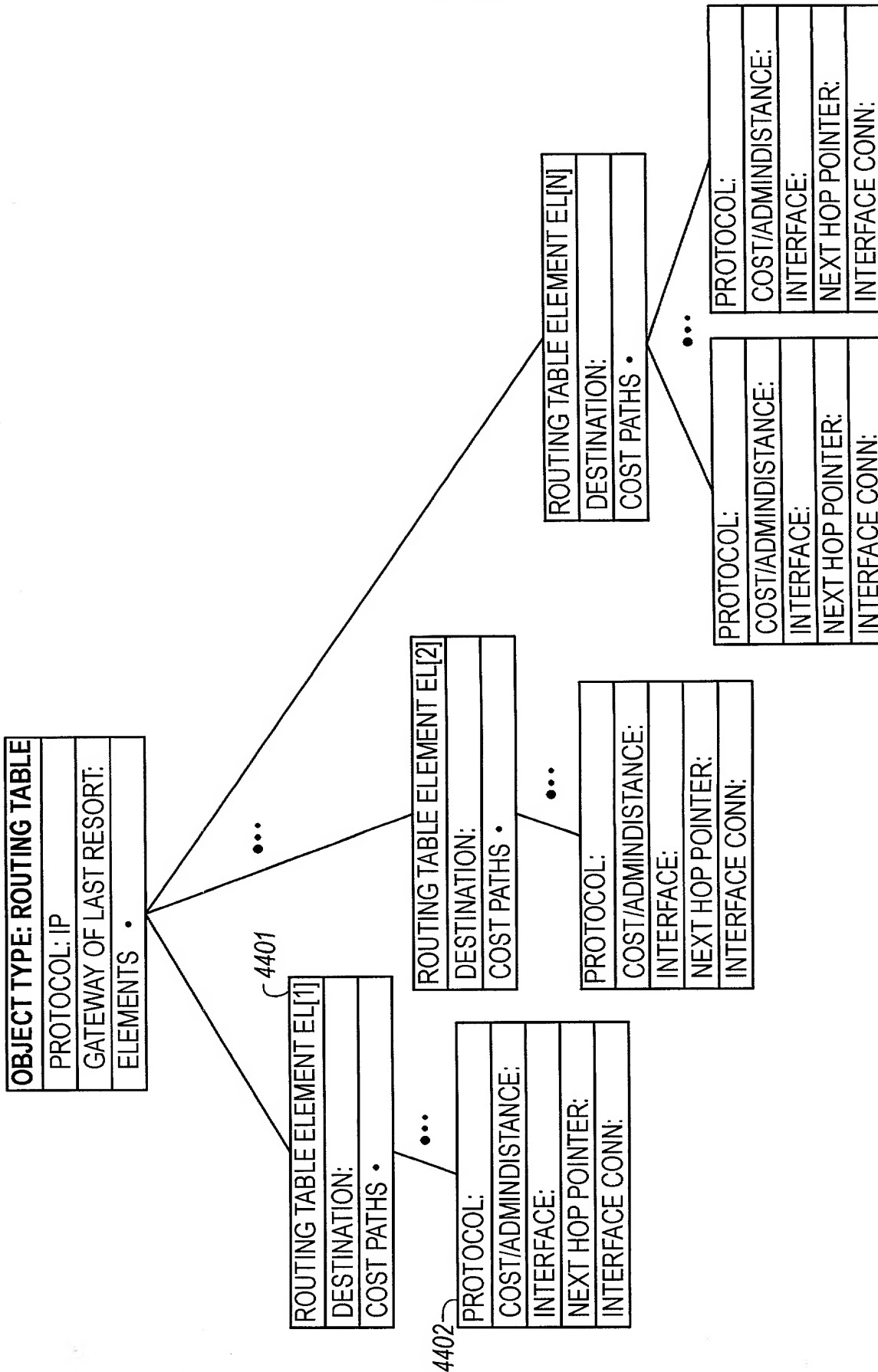
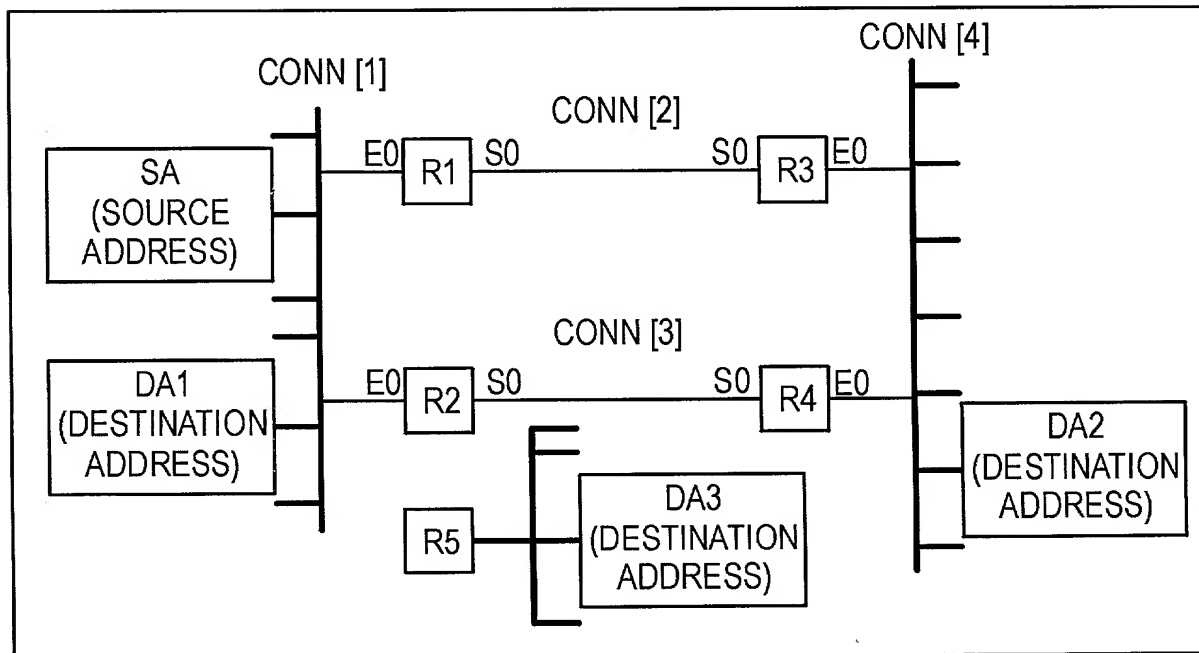


FIG. 44

202120"5034001

74/104



DATA LABELS USED IN CPS DISCUSSION		DEFINITION: COMPLETED PATH SET - CPS	
SC SOURCE CONNECTION		THE SET HAVING: NO ELEMENTS; 1 ELEMENT; OR, MORE THAN 1 ELEMENT	
DC DESTINATION CONNECTION		NO ELEMENTS MEANS: NO PATH FROM SA TO DA	
SA SOURCE ADDRESS		ONE (1) ELEMENT MEANS: ONE PATH FROM SA TO DA	
DA DESTINATION ADDRESS		MORE THAN ONE ELEMENT: MULTIPLE PATHS FROM SA TO DA	
CPS COMPLETED PATH SET		THE CPS FOR SA TO DA2 LOOKS LIKE:	
APS ACTIVE PATH SET		{[SA;CONN[1];R1;CONN[2];R3;CONN[4];DA2]	
SPT SINGLE PROTOCOL TOPOLOGY		{[SA;CONN[1];R2;CONN[3];R4;CONN[4]DA2]}	
CR CURRENT ROUTER		THE CPS FOR SA TO DA1 LOOKS LIKE:	
NC NEW CONNECTION		{[SA;CONN[1];DA1]}	
EL ROUTING TABLE ELEMENT		THE CPS FOR SA TO DA3 LOOKS LIKE:	
P PROTOCOL		{ }	
CPO COST PATH OBJECT			

FIG. 45

75/104

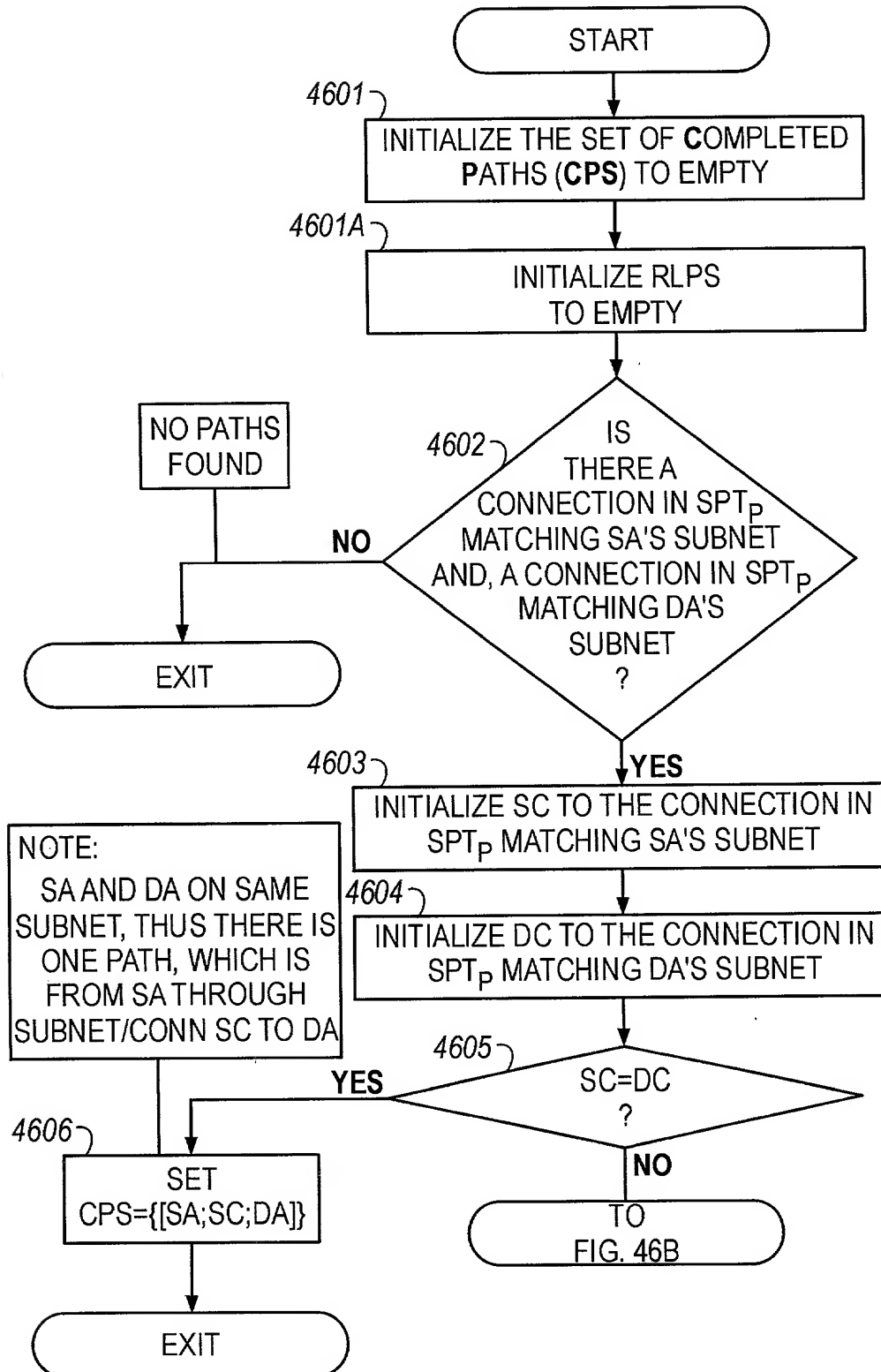


FIG. 46A

76/104

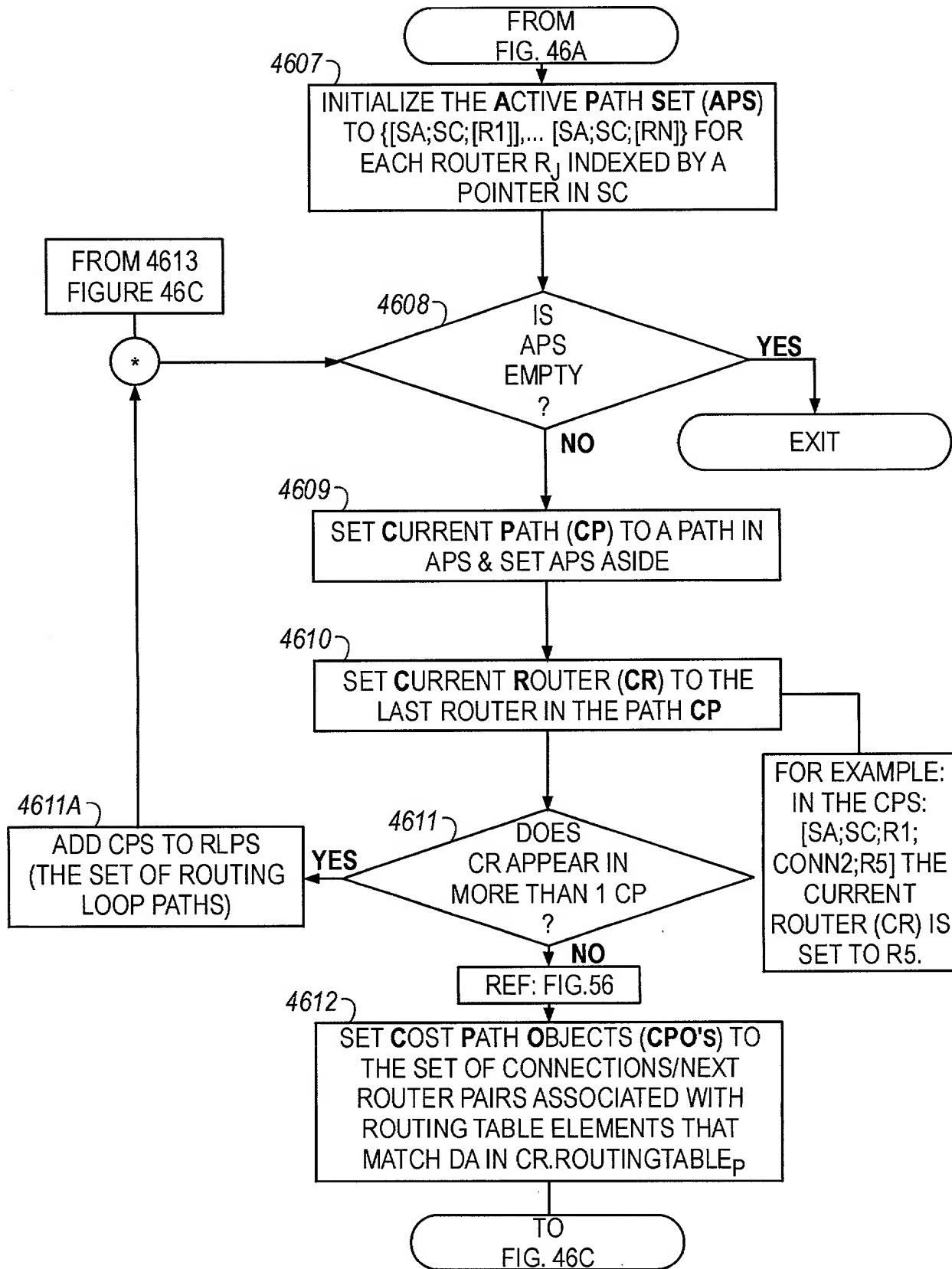
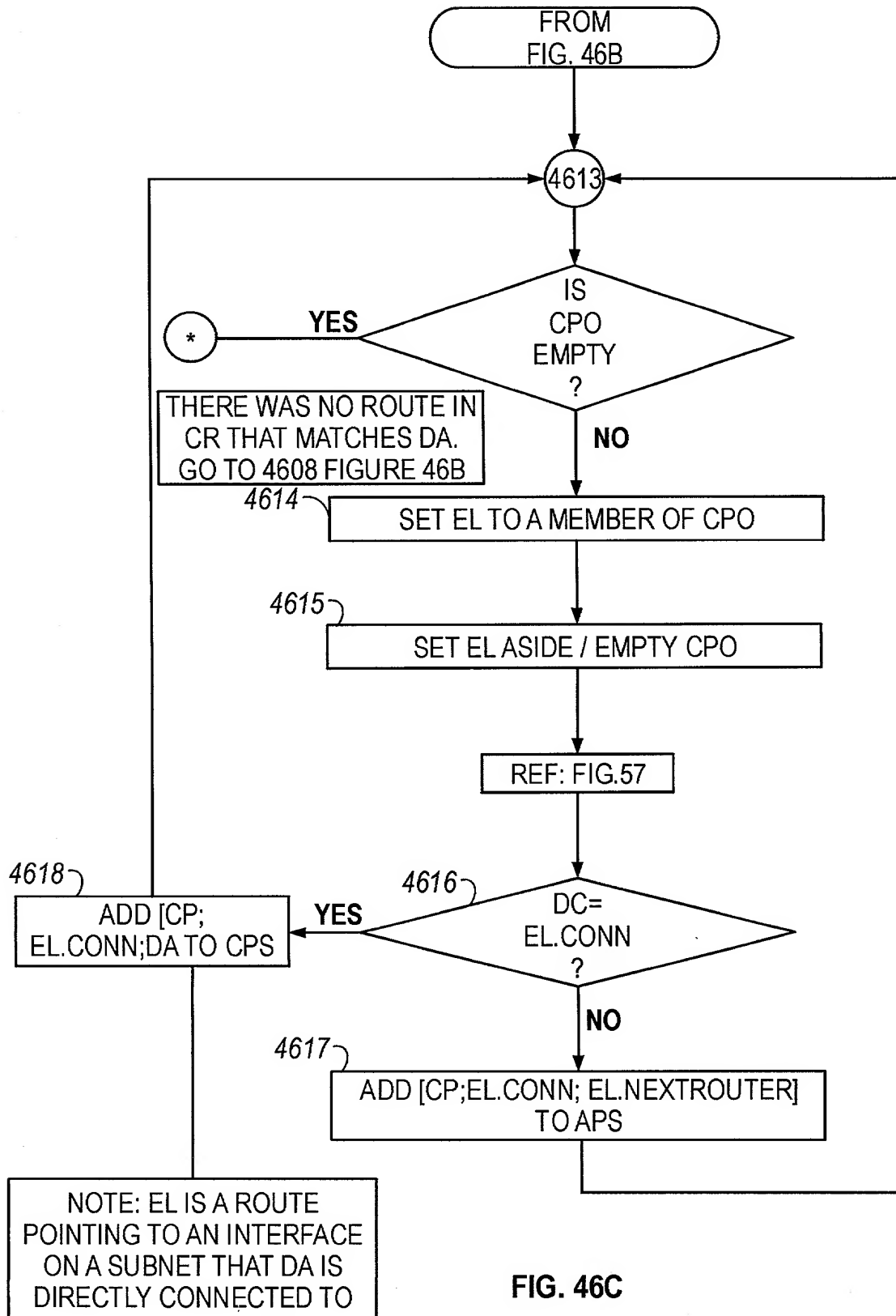


FIG. 46B

10074805 04202

77/104



78/104

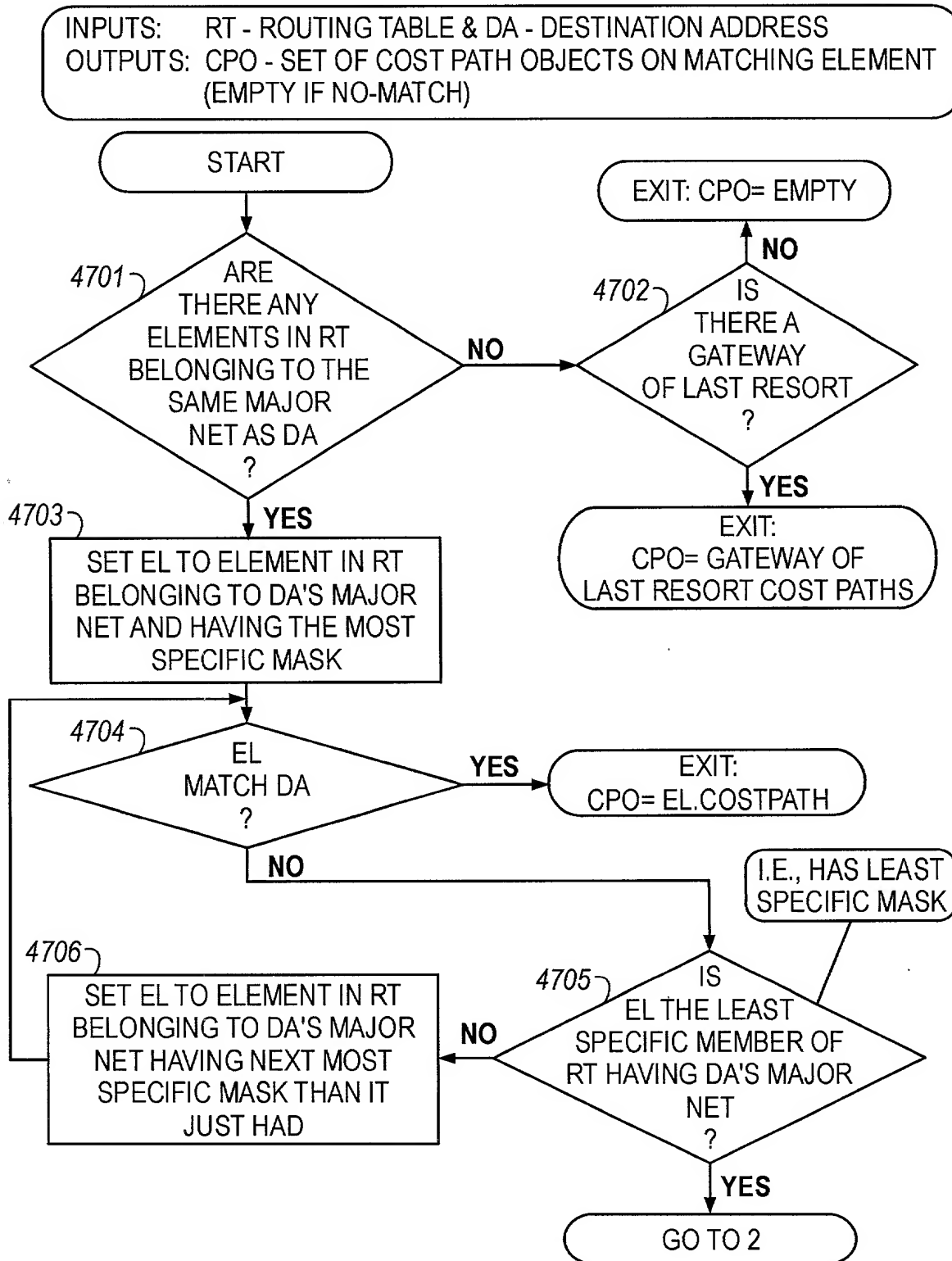


FIG. 47



FIG. 48

80/104

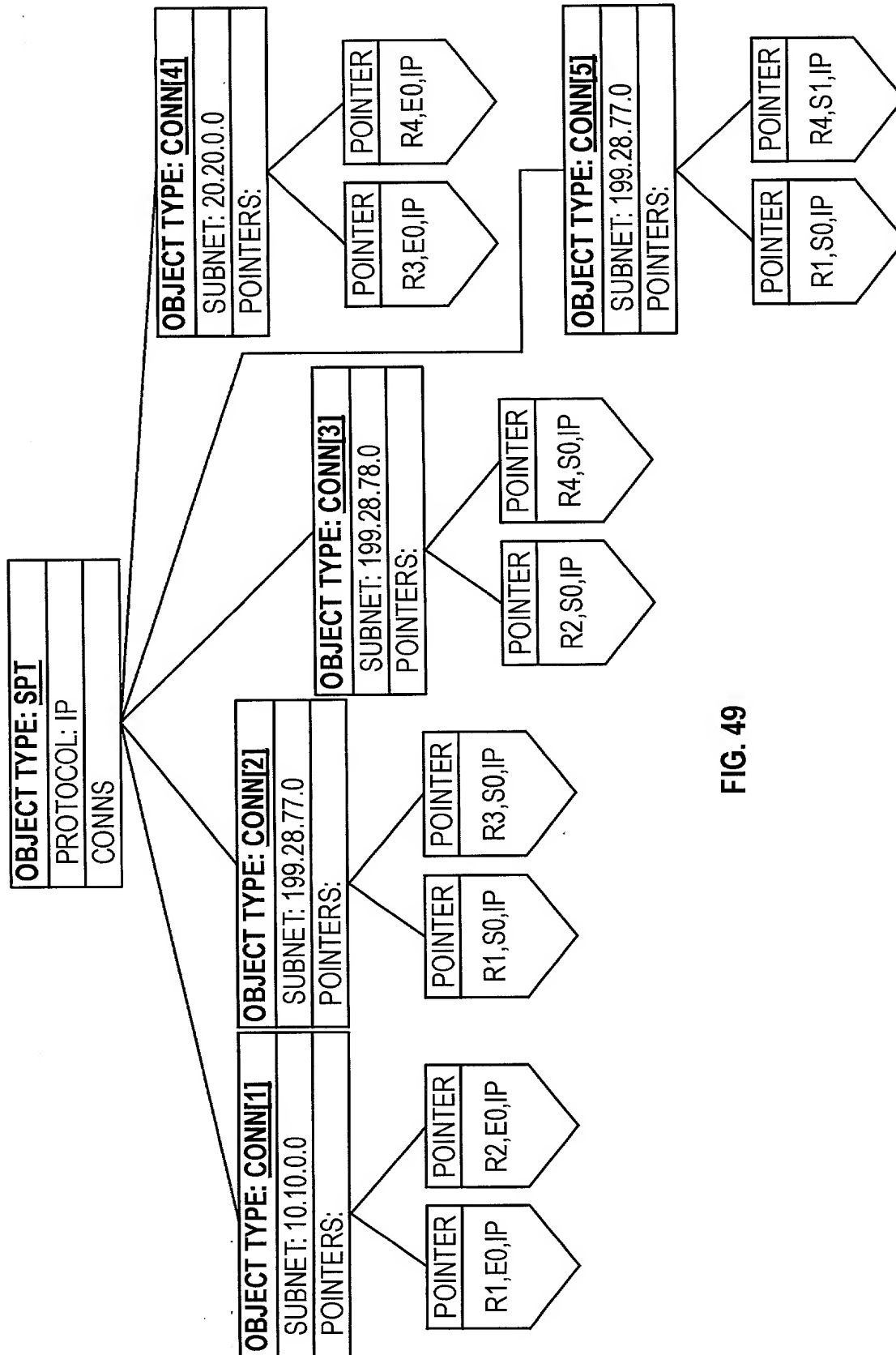


FIG. 49

81/104

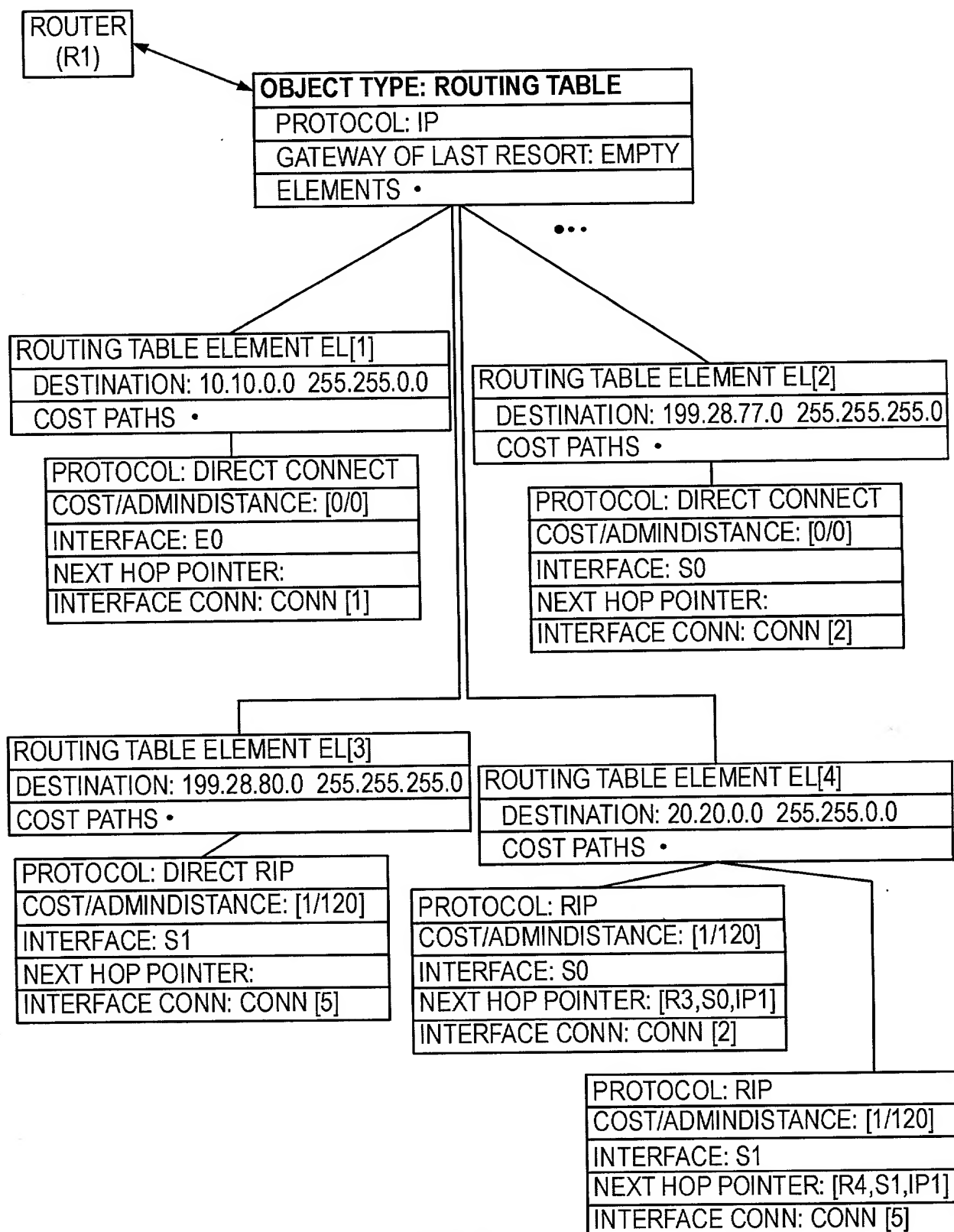


FIG. 50

82/104

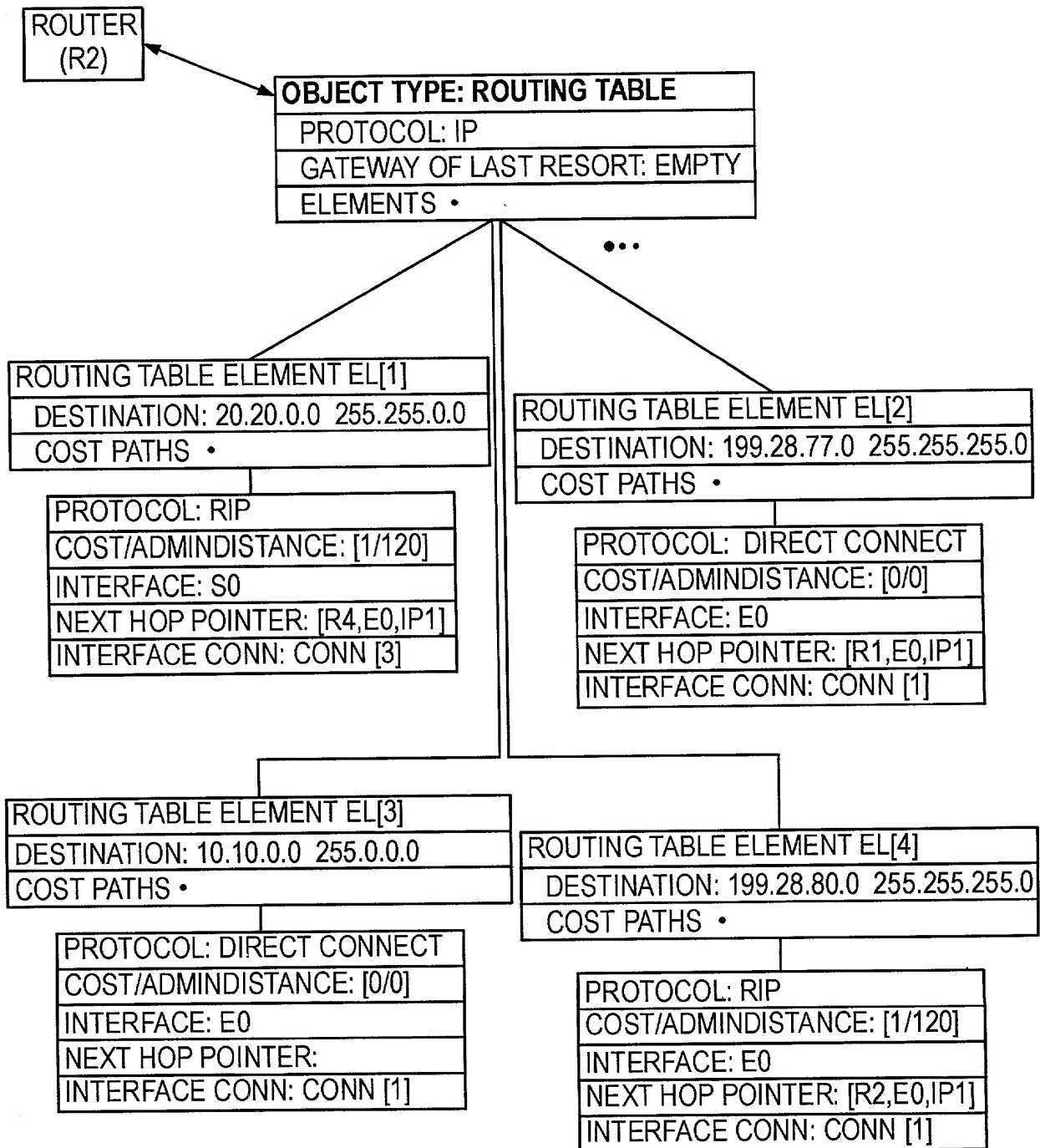


FIG. 51

83/104

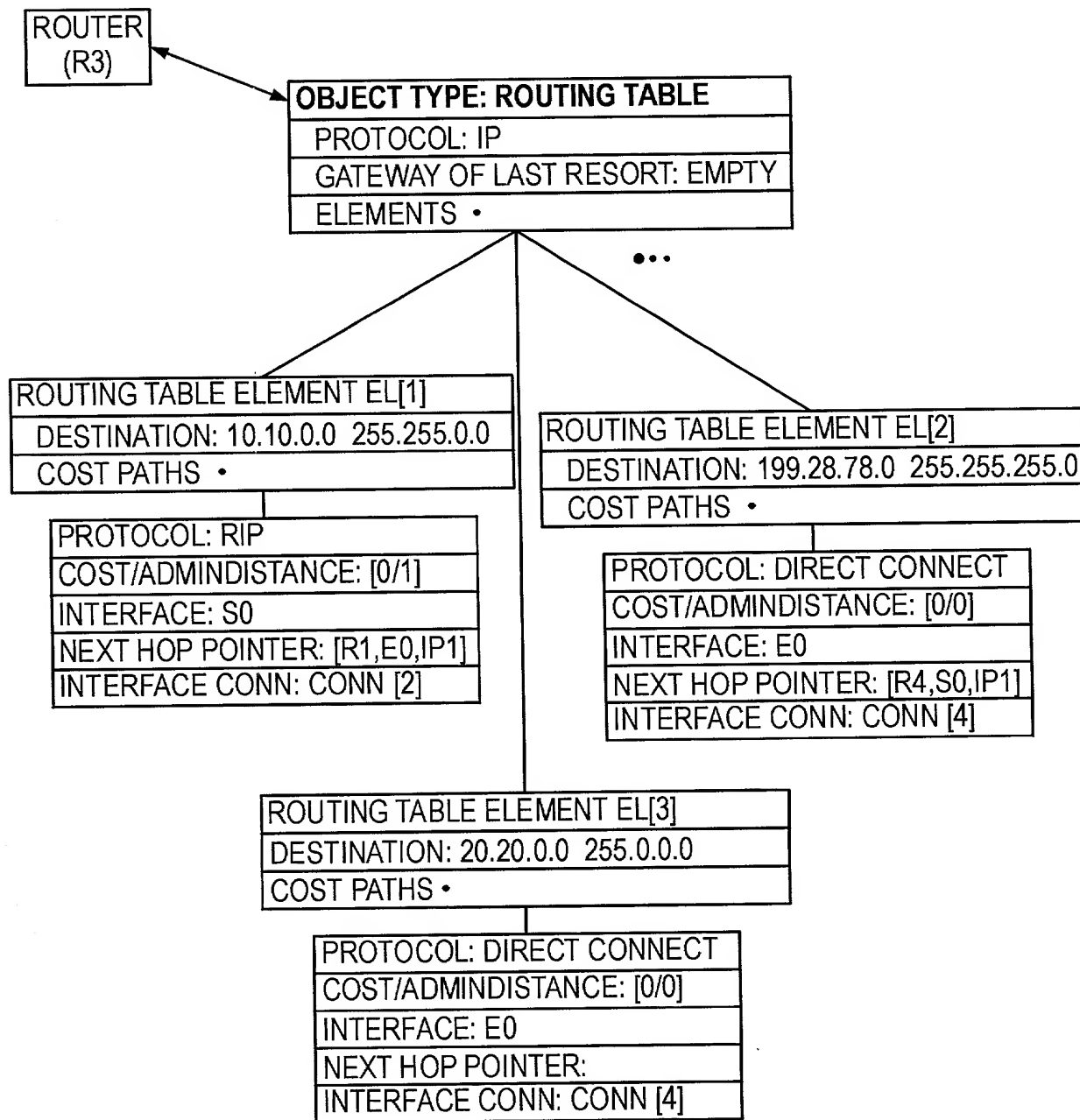


FIG. 52A

84/104

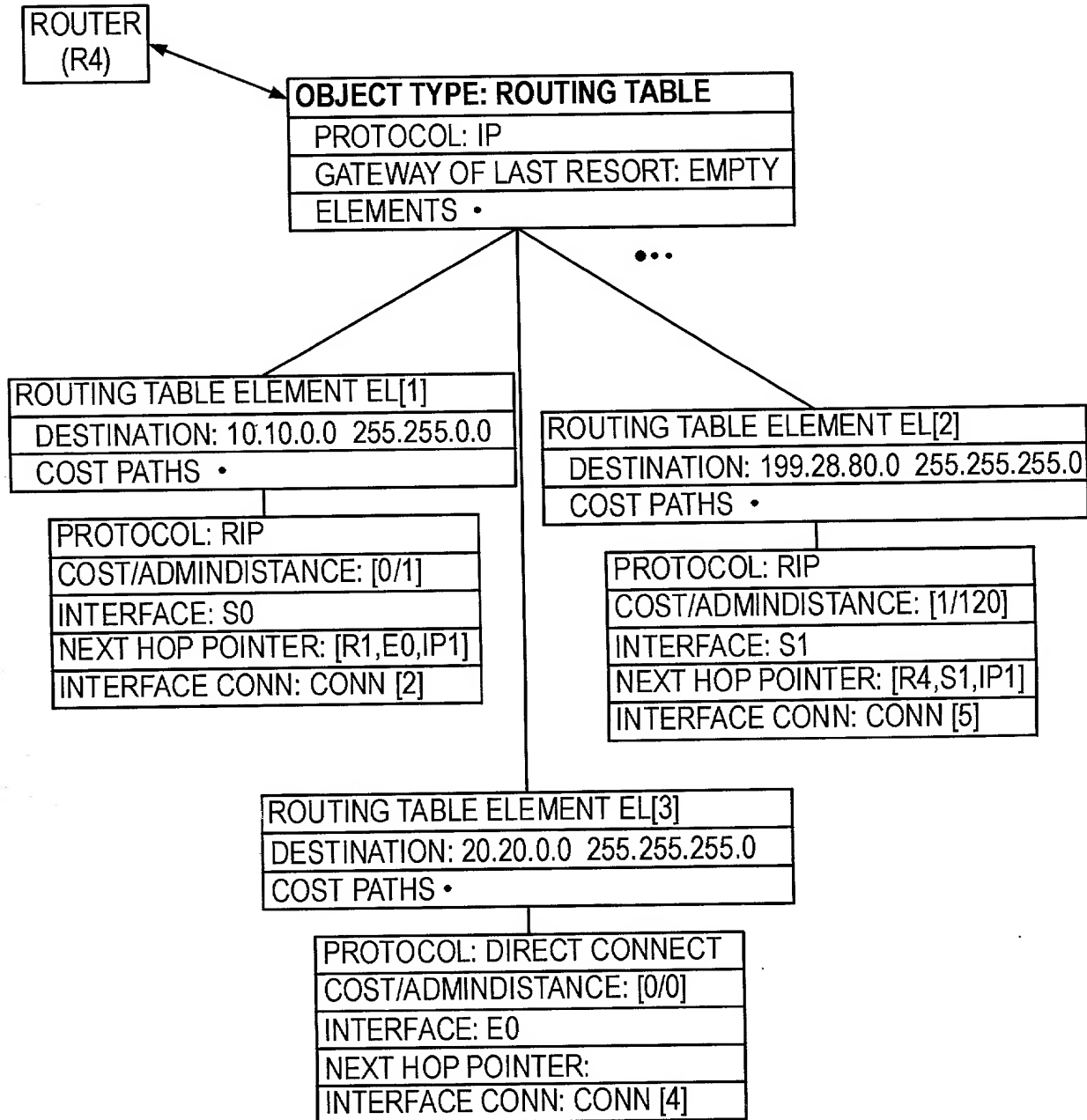


FIG. 52B

85/104

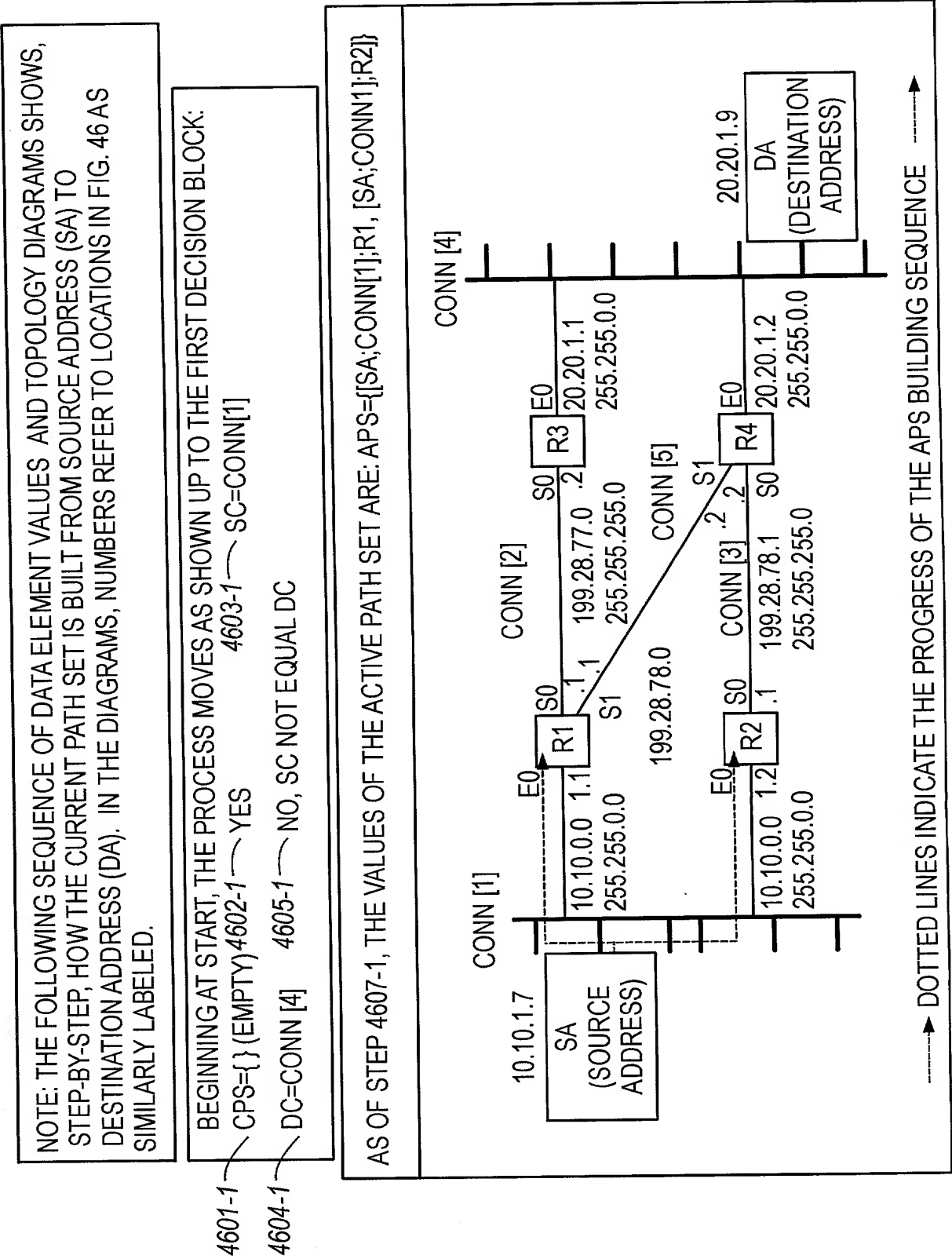


FIG. 53A

86/104

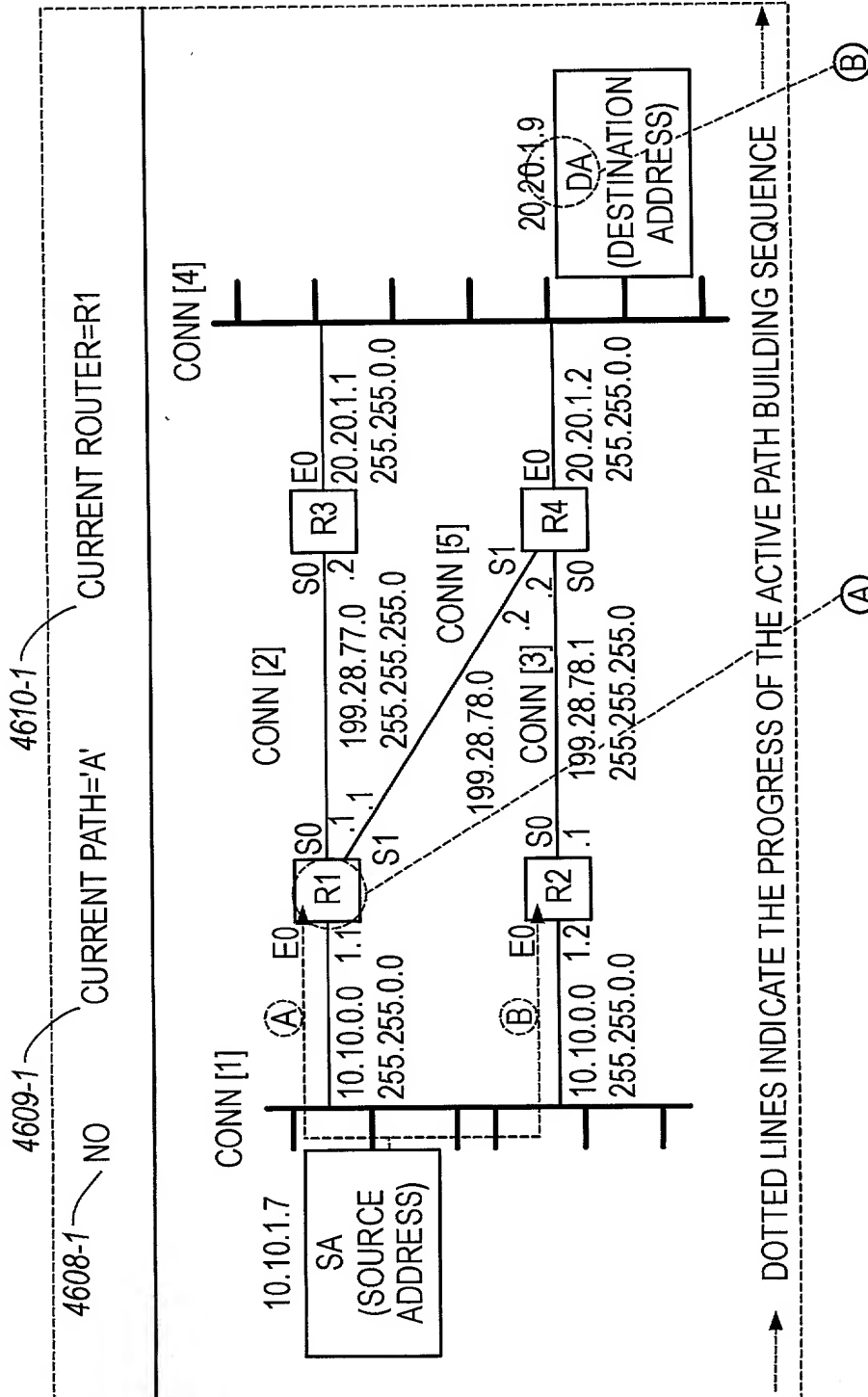


FIG. 53B

87/104

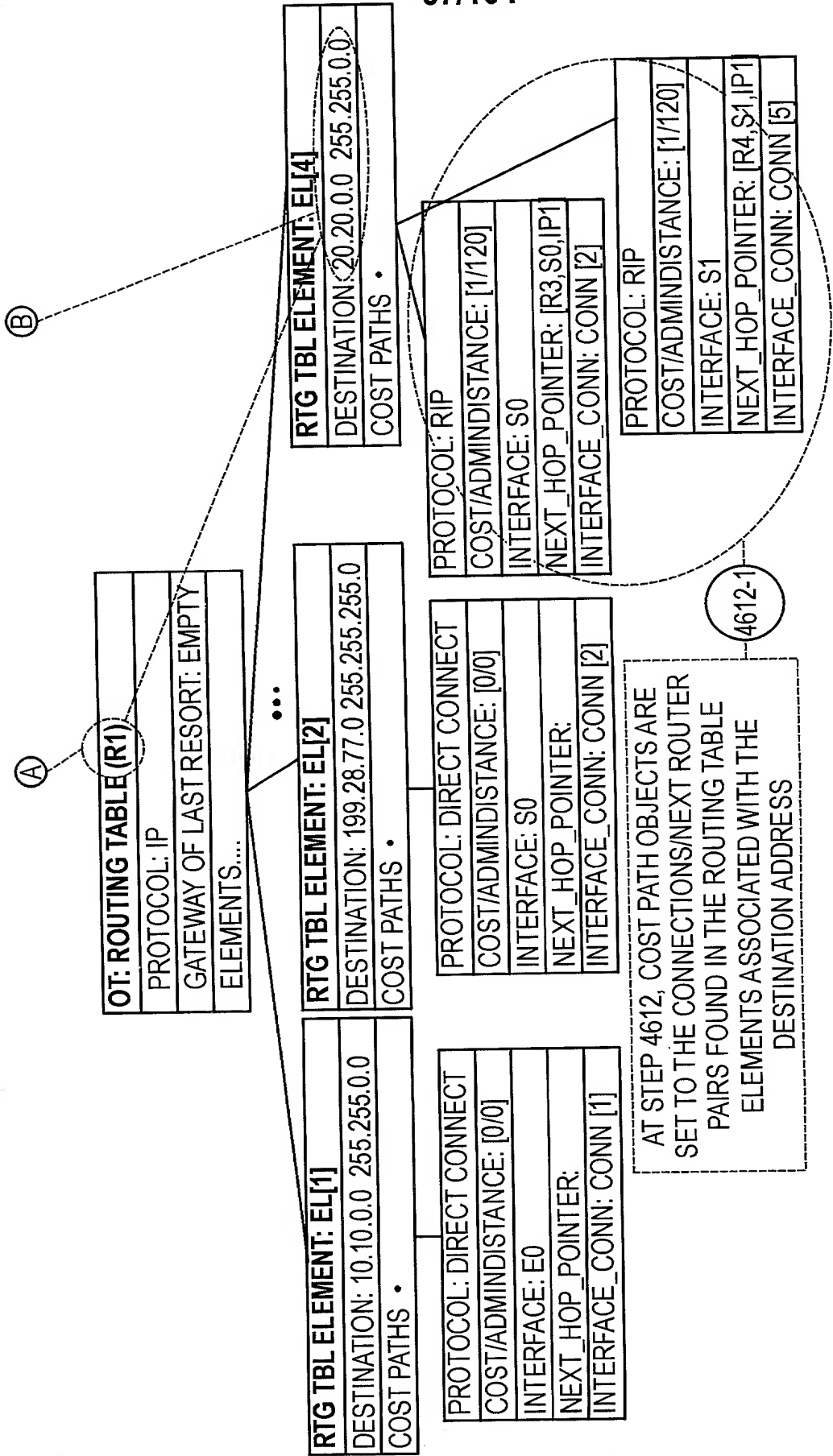


FIG. 53C

88/104

PROTOCOL: RIP
COST/ADMINDISTANCE: [1/120]
INTERFACE: S0
NEXT_HOP_POINTER: [R3,S0,IP1]
INTERFACE_CONN: CONN [2]

4613-1 FINDING ROUTES TO DA,
TEST 13 IS FAILED

4614-1, 4615-1 EL IS SET TO A MEMBER O THE
COST PATH OBJECTS (CPO'S)

4616-1 DEST. CONN (DC) = CONN[4]
EL.CONN=CONN[2]: FAILS TEST

4617-1

ADD [CP;EL.CONN; EL;NEXTROUTER TO APS
 APS={ [SA;CONN[1];R1;CONN[2];R3], [SA;CONN[1];R2]}
 (A) (B)

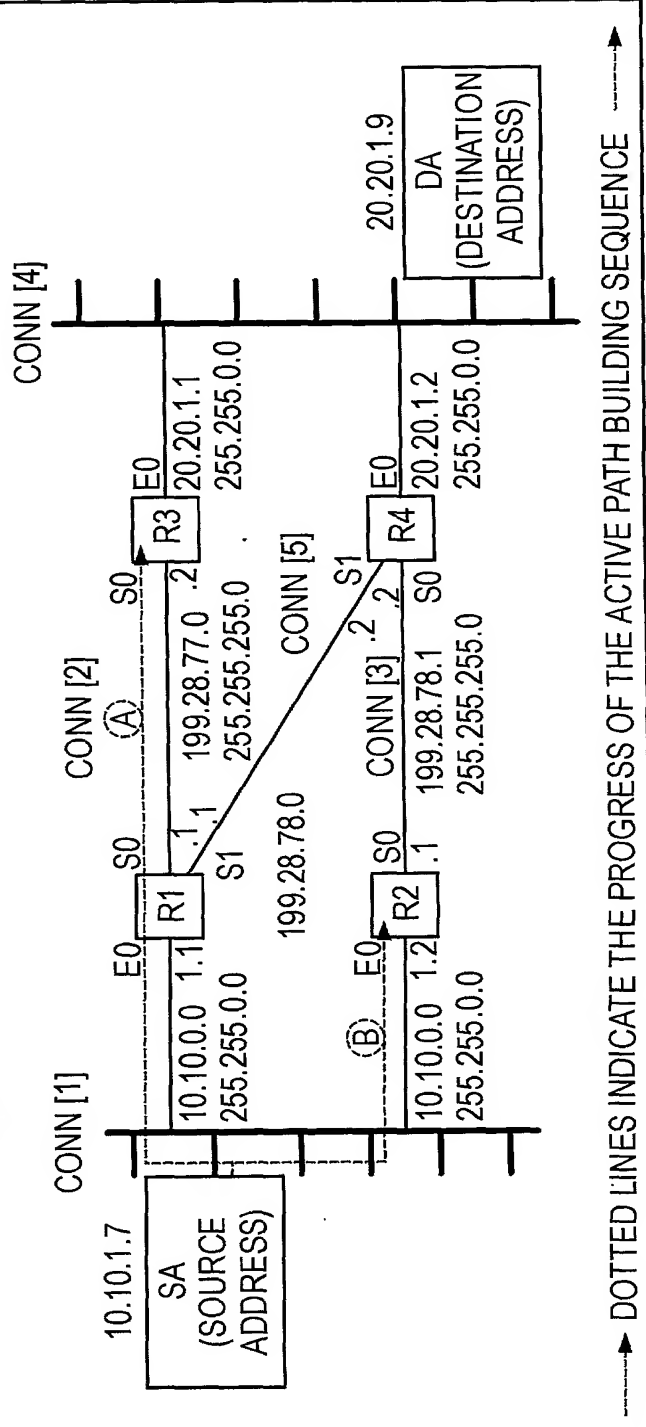


FIG. 53D

AFTER STEP 4617,
THE FLOW
BRANCHES BACK
UP TO STEP 4613...

FIG. 53E

90/104

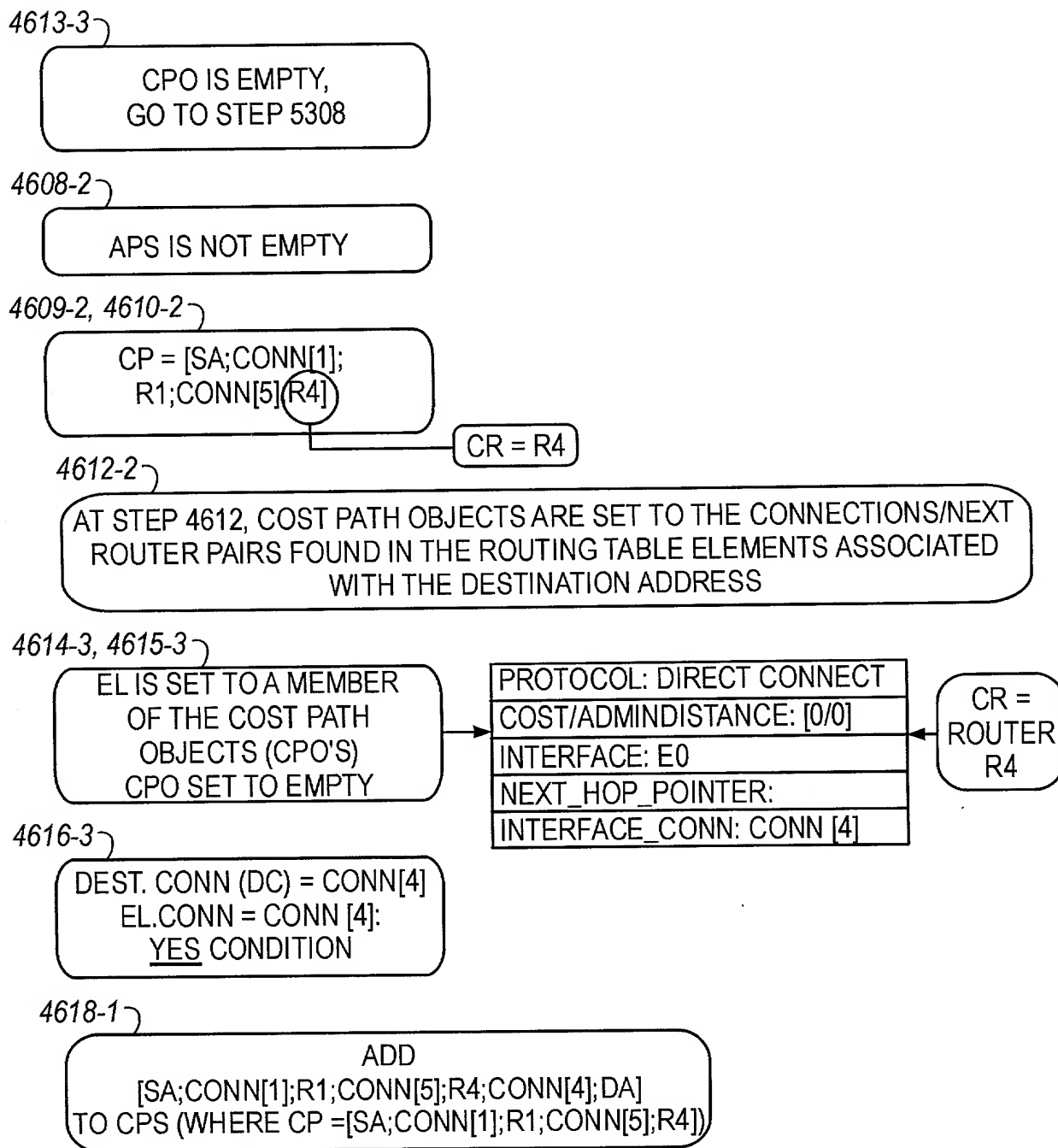
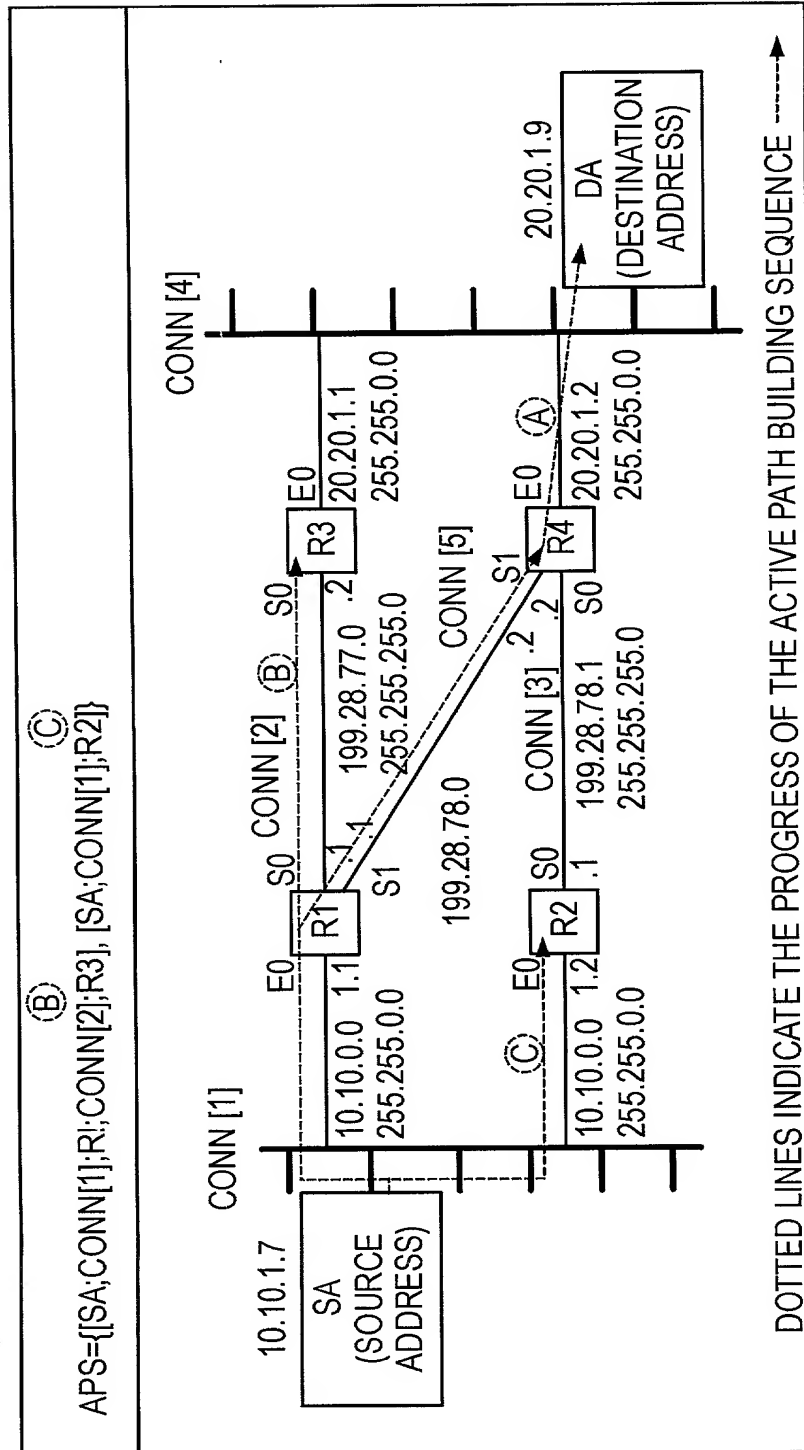


FIG. 53F

91/104



NOTE: AT THIS JUNCTURE, THE FIRST COMPLETED PATH FROM SA TO DA HAS BEEN ESTABLISHED. THE ALGORITHM WILL CONTINUE AS SHOWN ABOVE BETWEEN STEP 4613-3, AND STEP 4608-2 UNTIL ALL PATHS HAVE BEEN ESTABLISHED. THEN THE APS WILL BE EMPTY AND THE ALGORITHM EXITED.

FIG. 53G

92/104

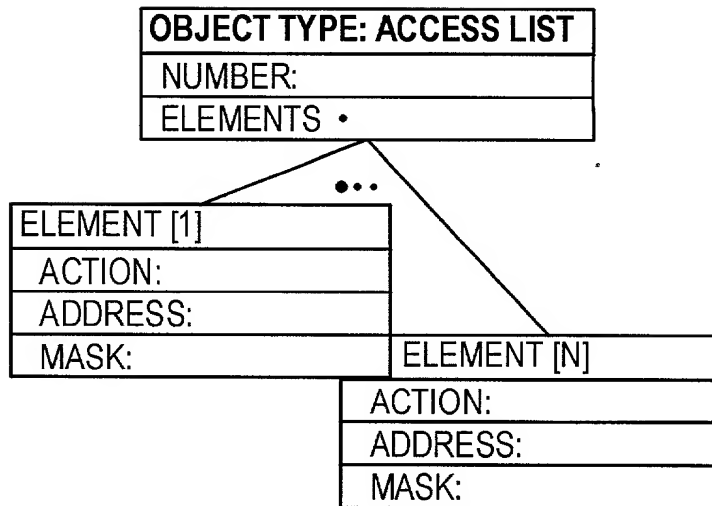


FIG. 54

93/104

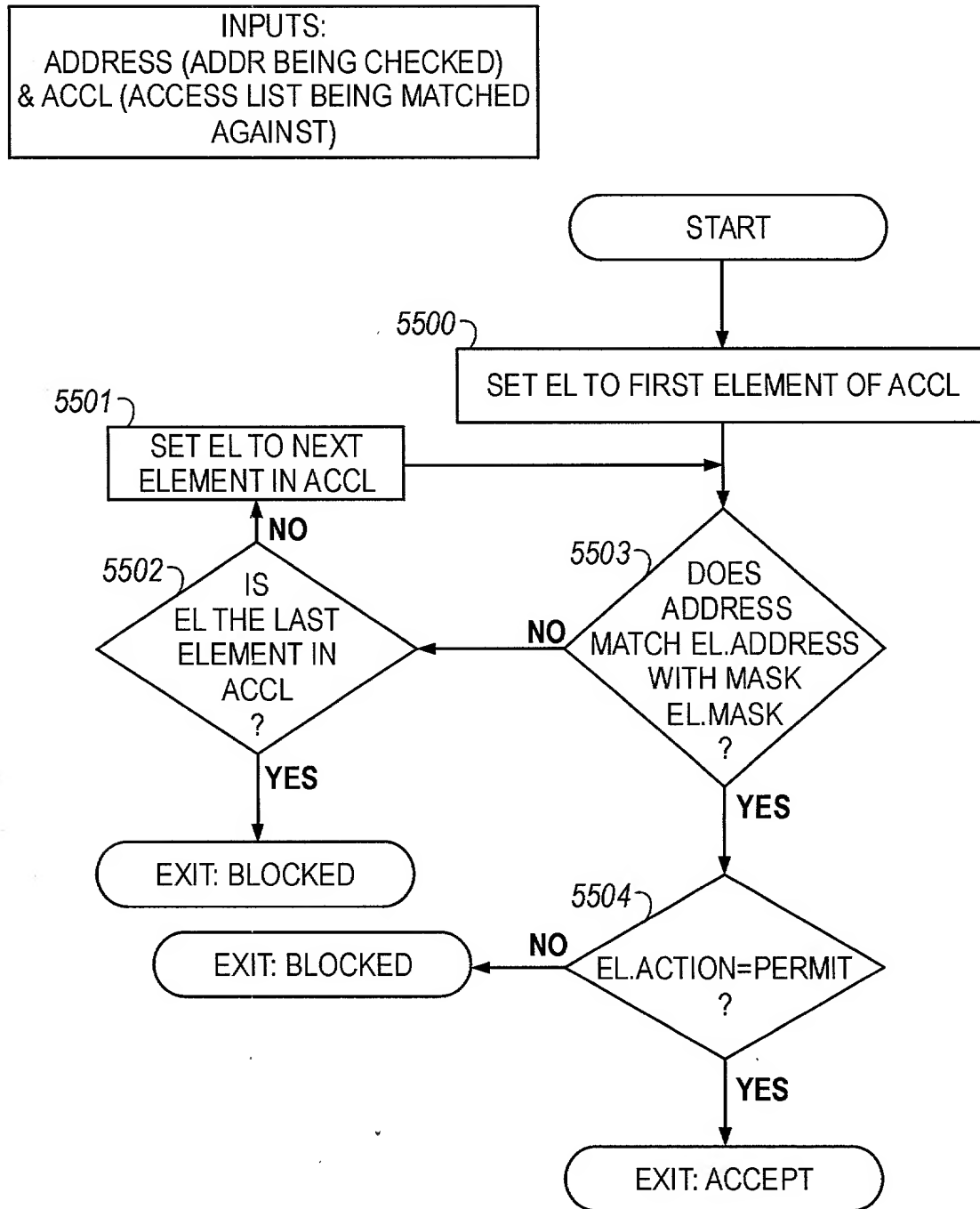


FIG. 55

94/104

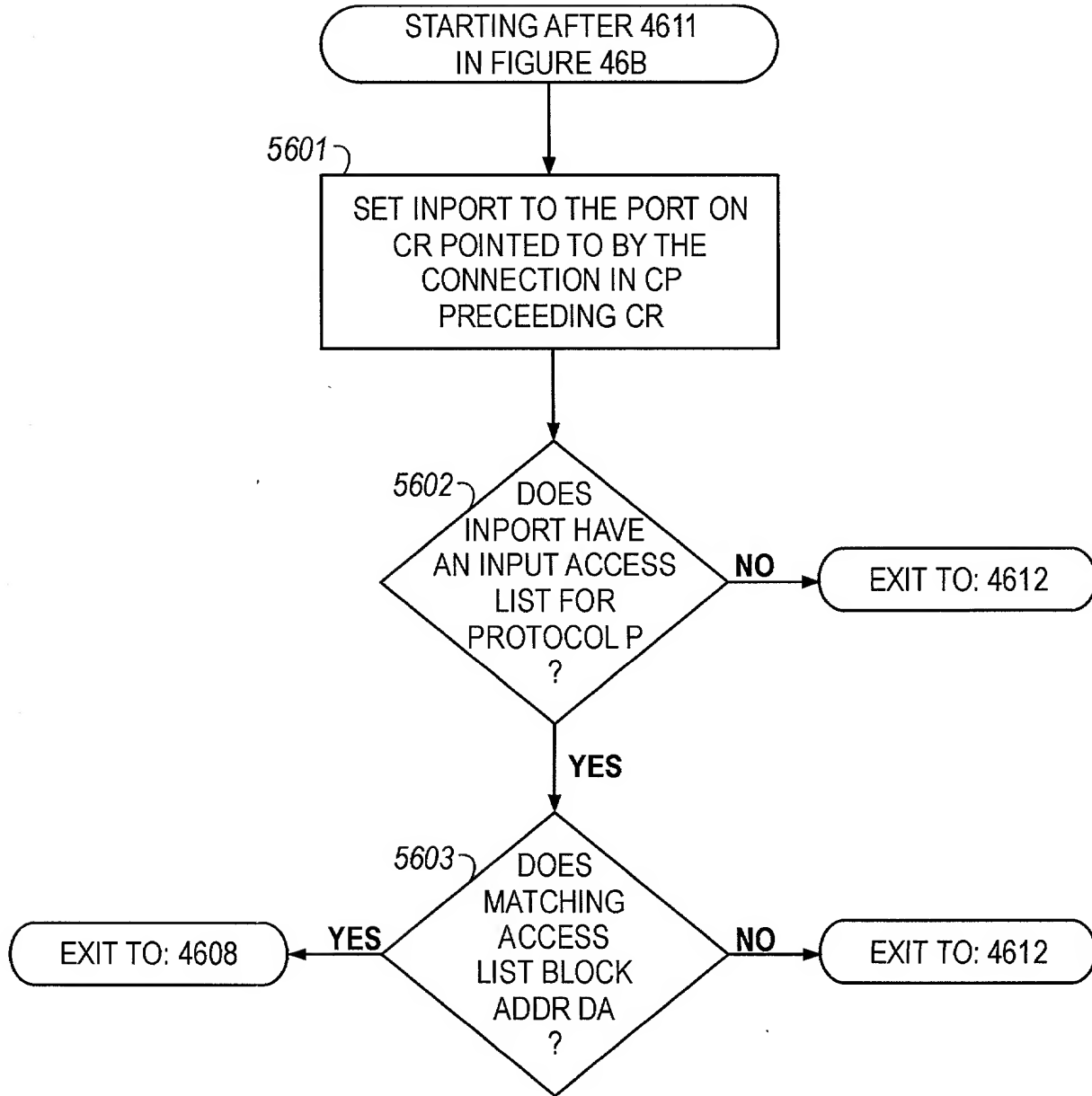


FIG. 56

95/104

NOTE: THIS CHART
INTEGRATES WITH
FIG. 46C

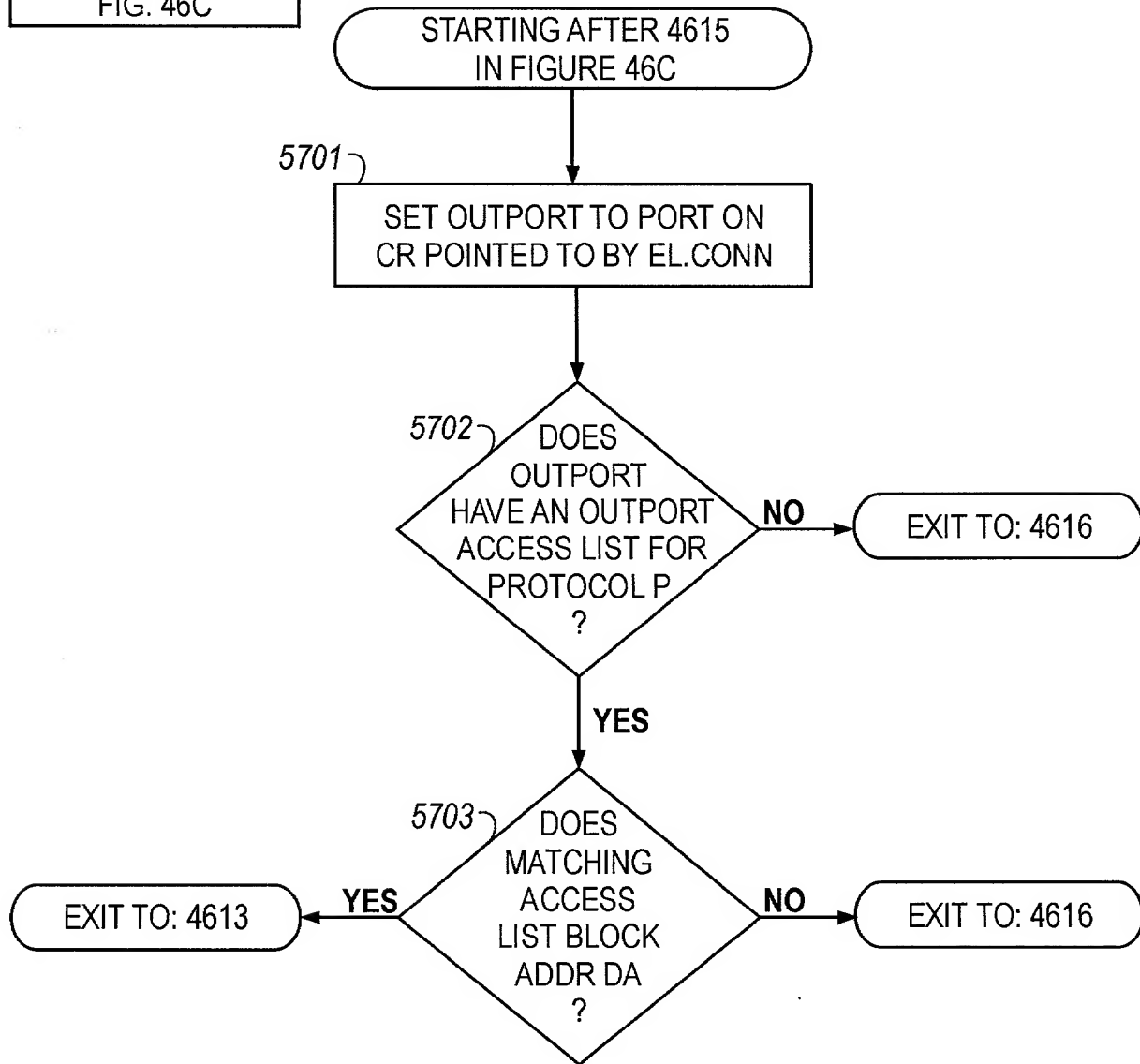


FIG. 57

96/104

NOTE: THIS CHART
INTEGRATES WITH
FIG. 46B

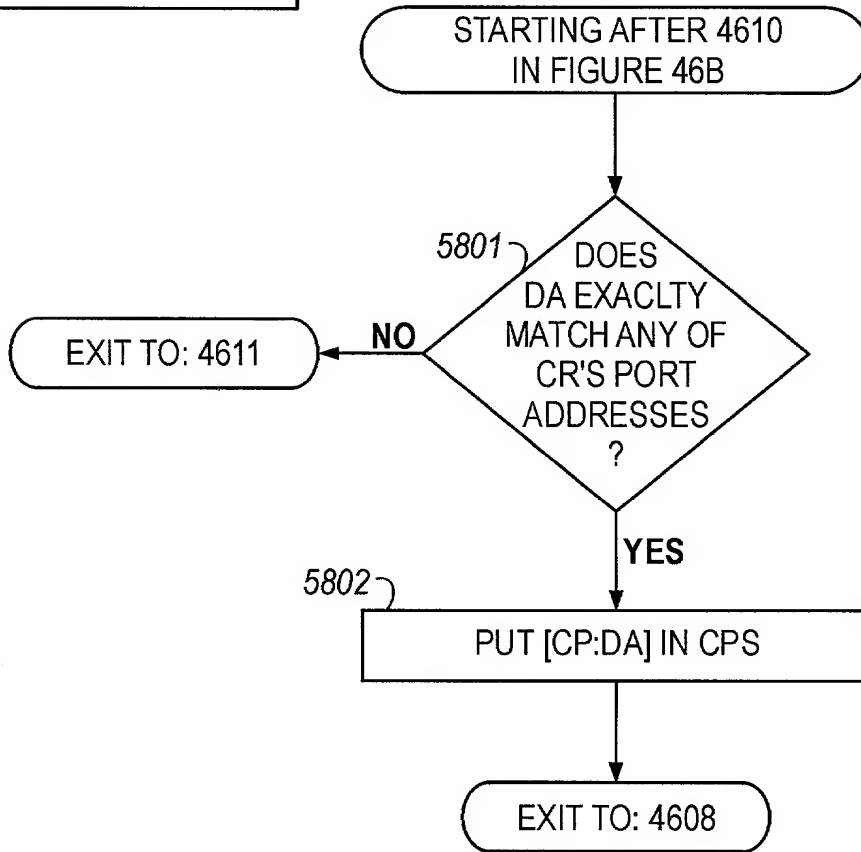


FIG. 58

97/104

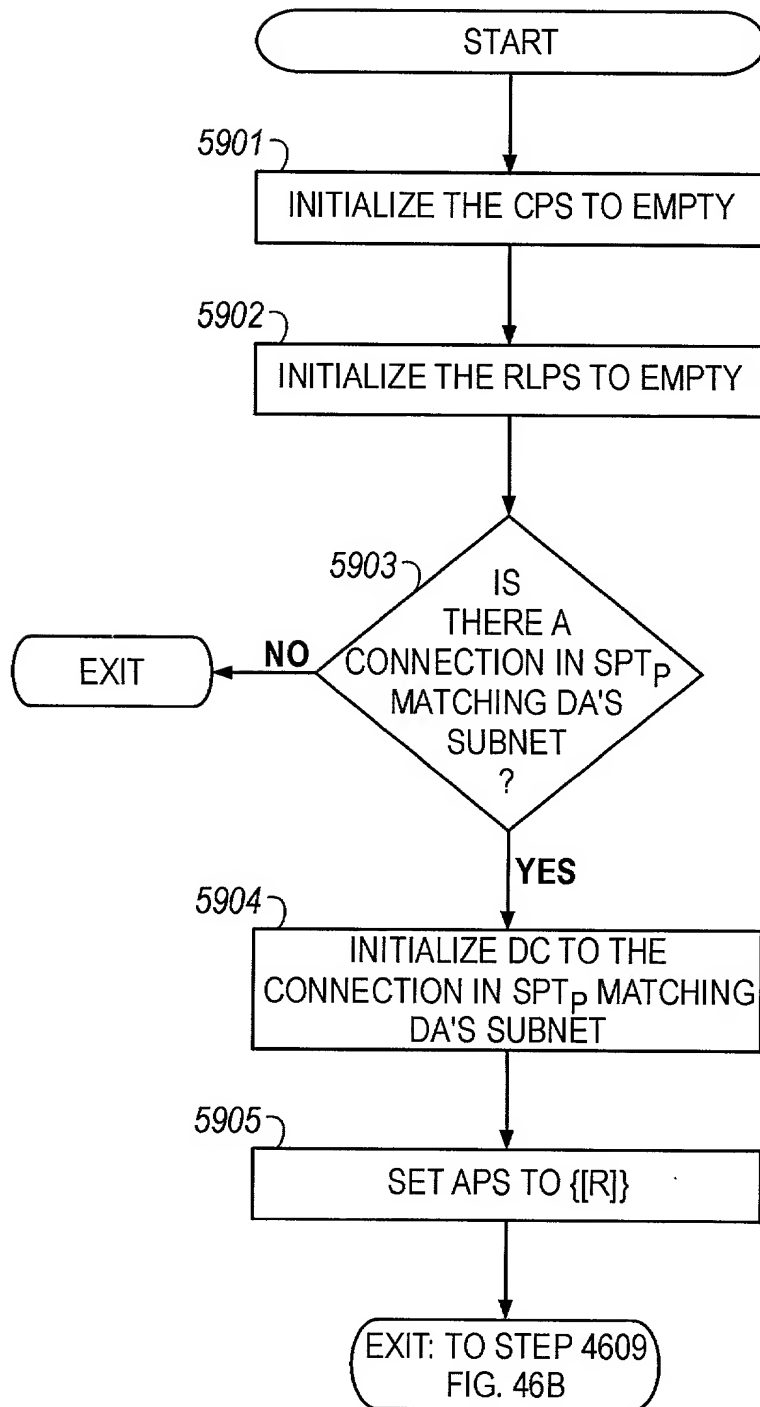


FIG. 59

98/104

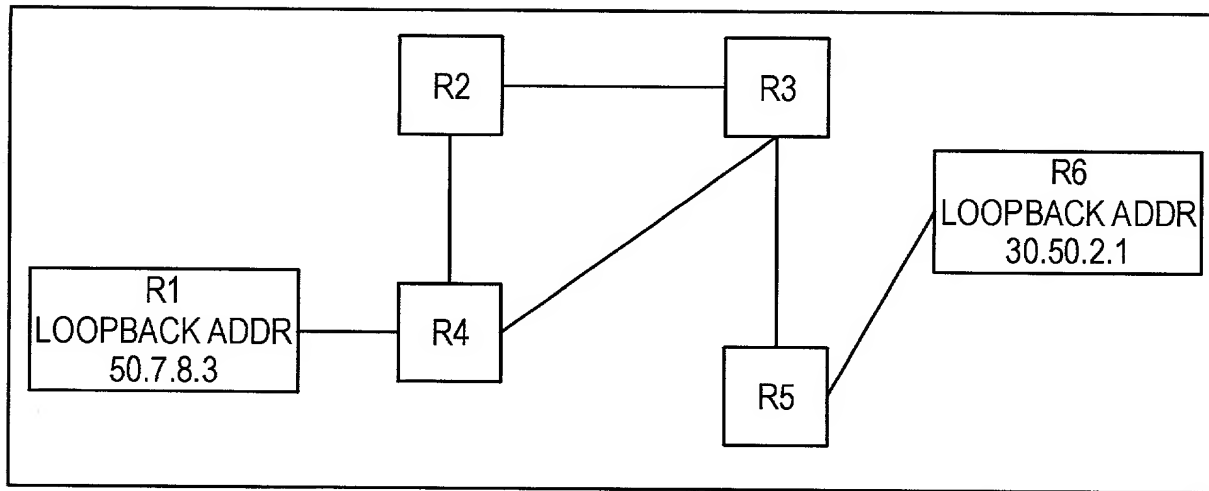


FIG. 60

ROUTER R1:

```
VERSION 10.0
!
HOSTNAME ROUTER1
!
SOURCE-BRIDGE RING-GROUP 7
SOURCE-BRIDGE 7 TCP 30.50.2.1
!
INTERFACE LOOPBACK 1
IP ADDRESS 50.7.8.3 255.255.0.0
!
END
```

FIG. 61A

ROUTER R6:

```
VERSION 10.0
!
HOSTNAME ROUTER6
!
SOURCE-BRIDGE RING-GROUP 7
SOURCE-BRIDGE 7 TCP 50.7.8.3
!
INTERFACE LOOPBACK 0
IP ADDRESS 30.50.2.1 255.255.0.0
!
END
```

FIG. 61B

2025-03-20 50325-0630

99/104

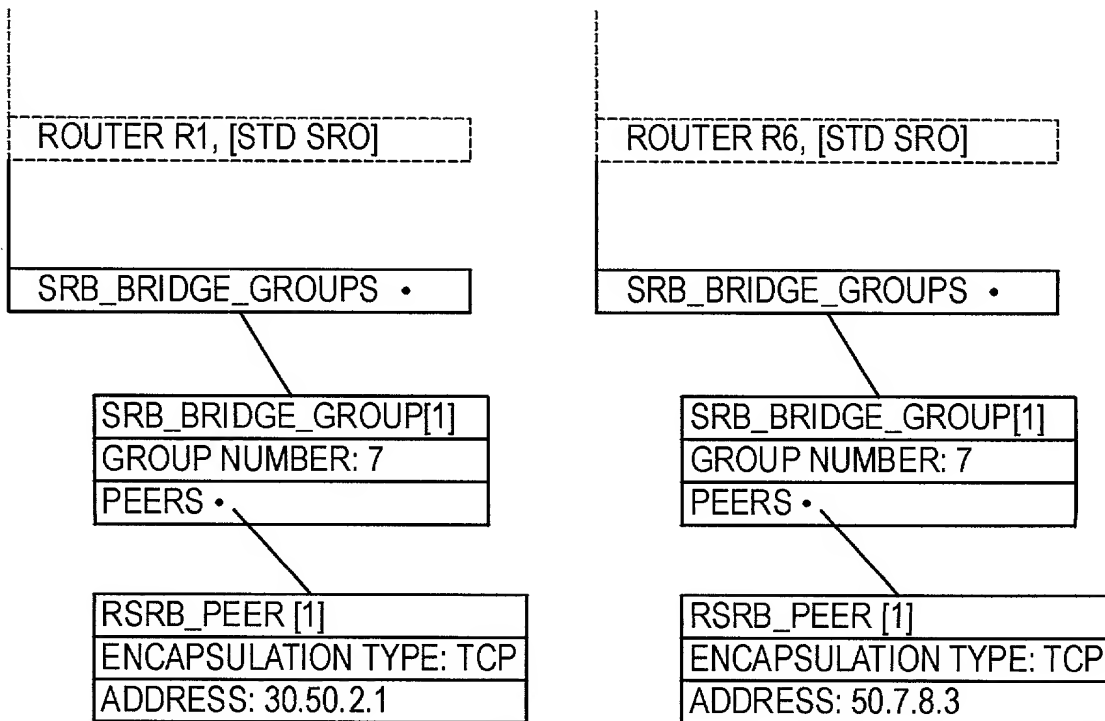


FIG. 62

100/104

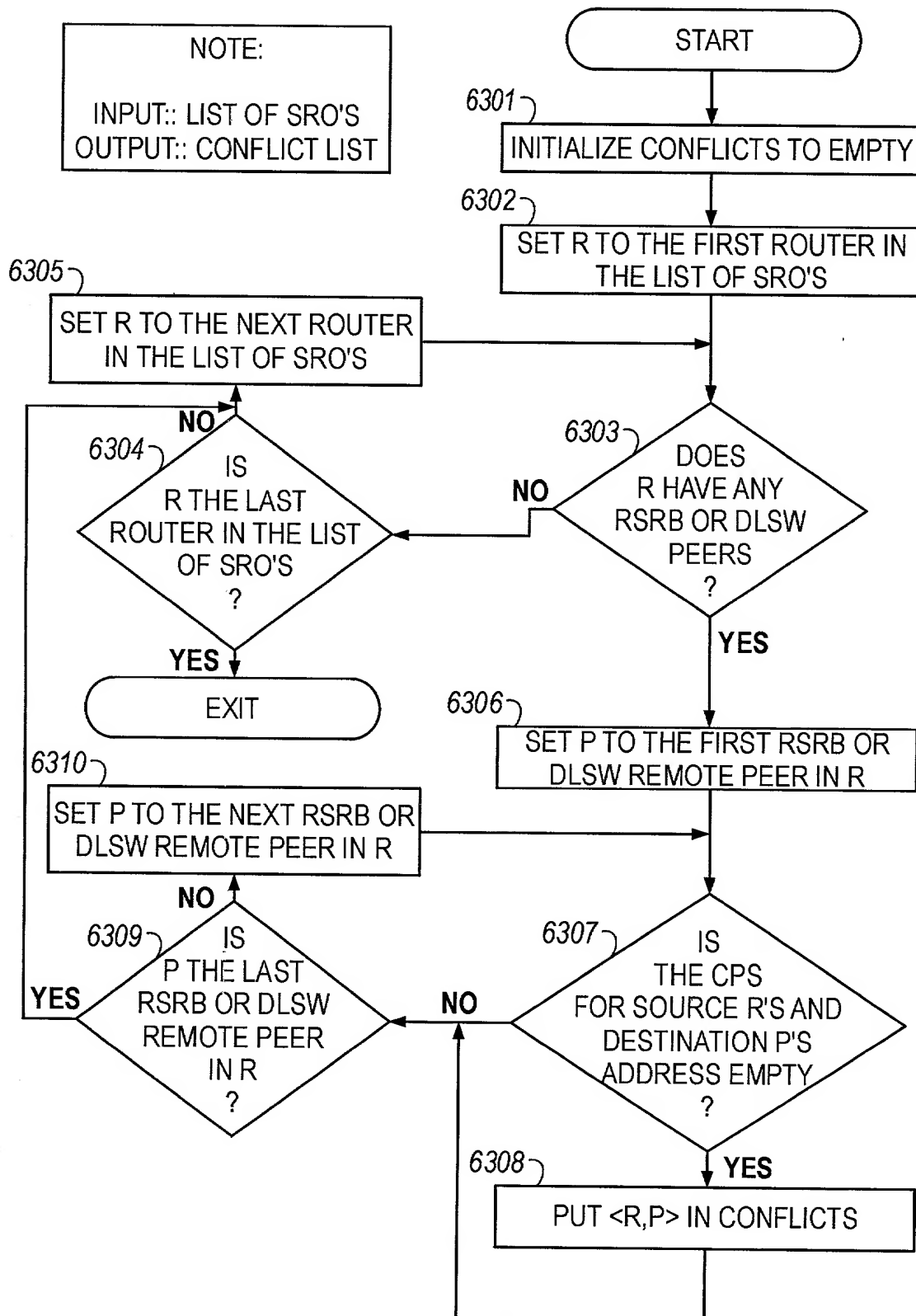


FIG. 63

10074805.031202
 202120 50342001

101/104

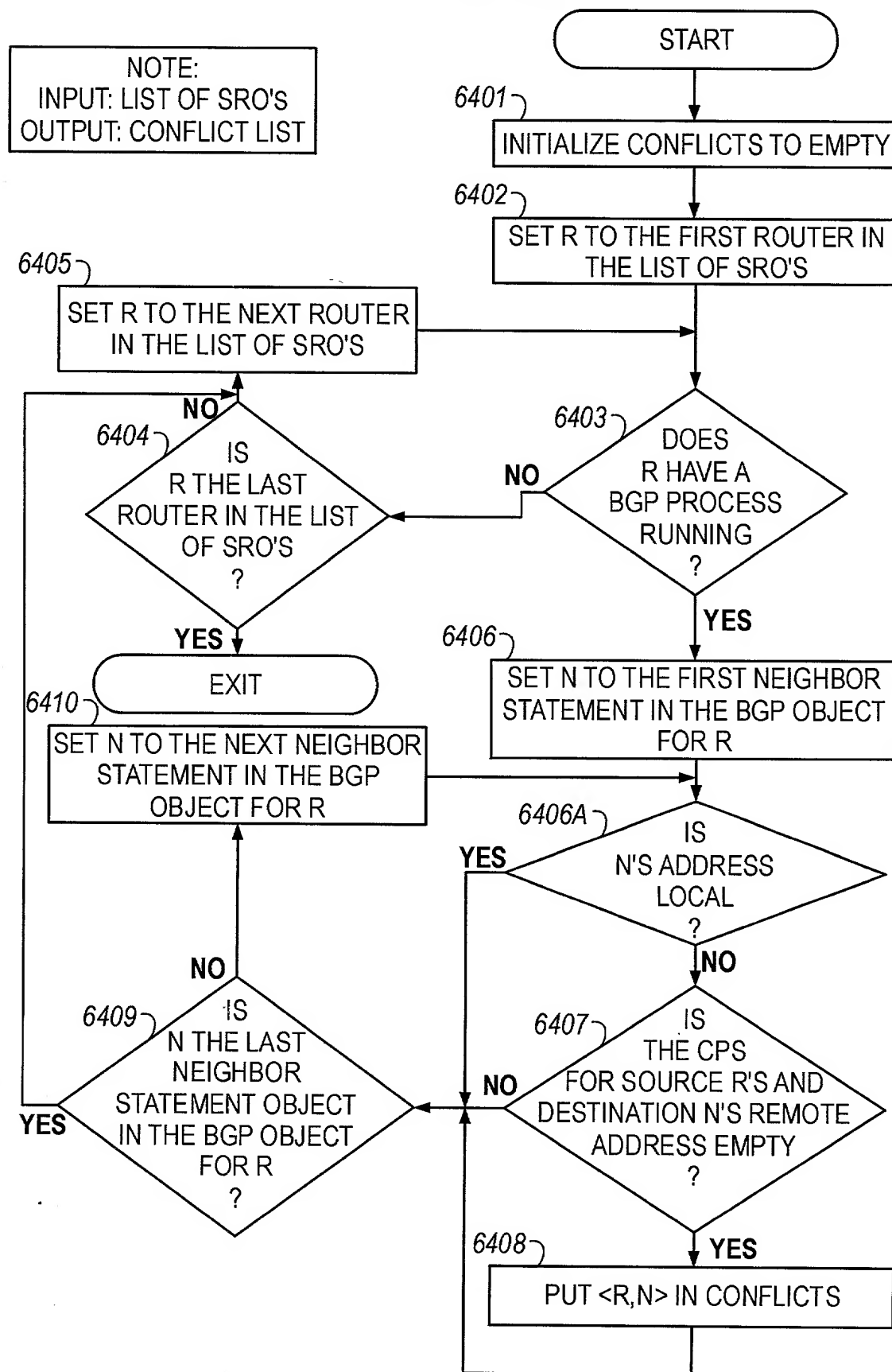


FIG. 64

102/104

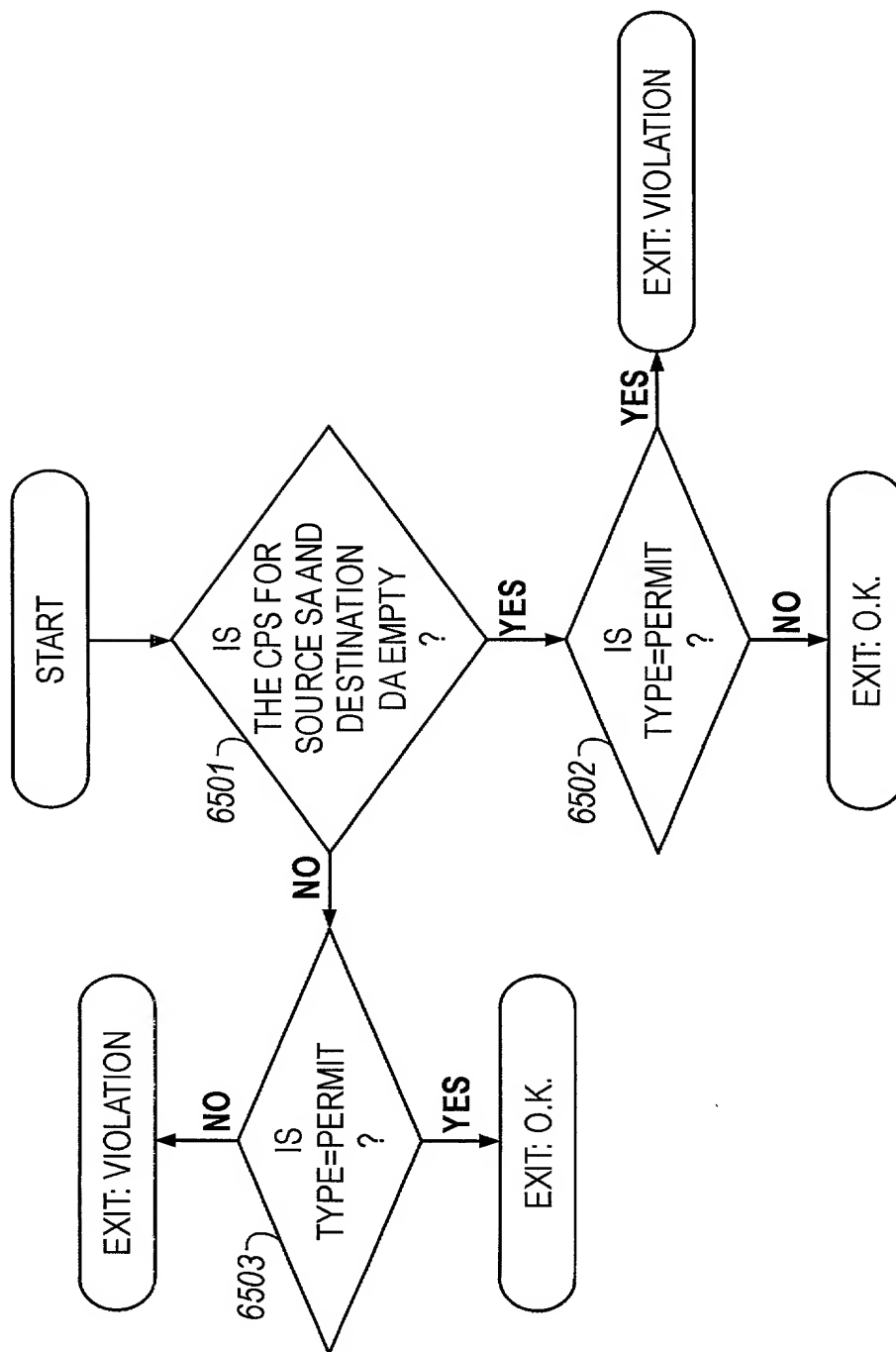


FIG. 65

103/104

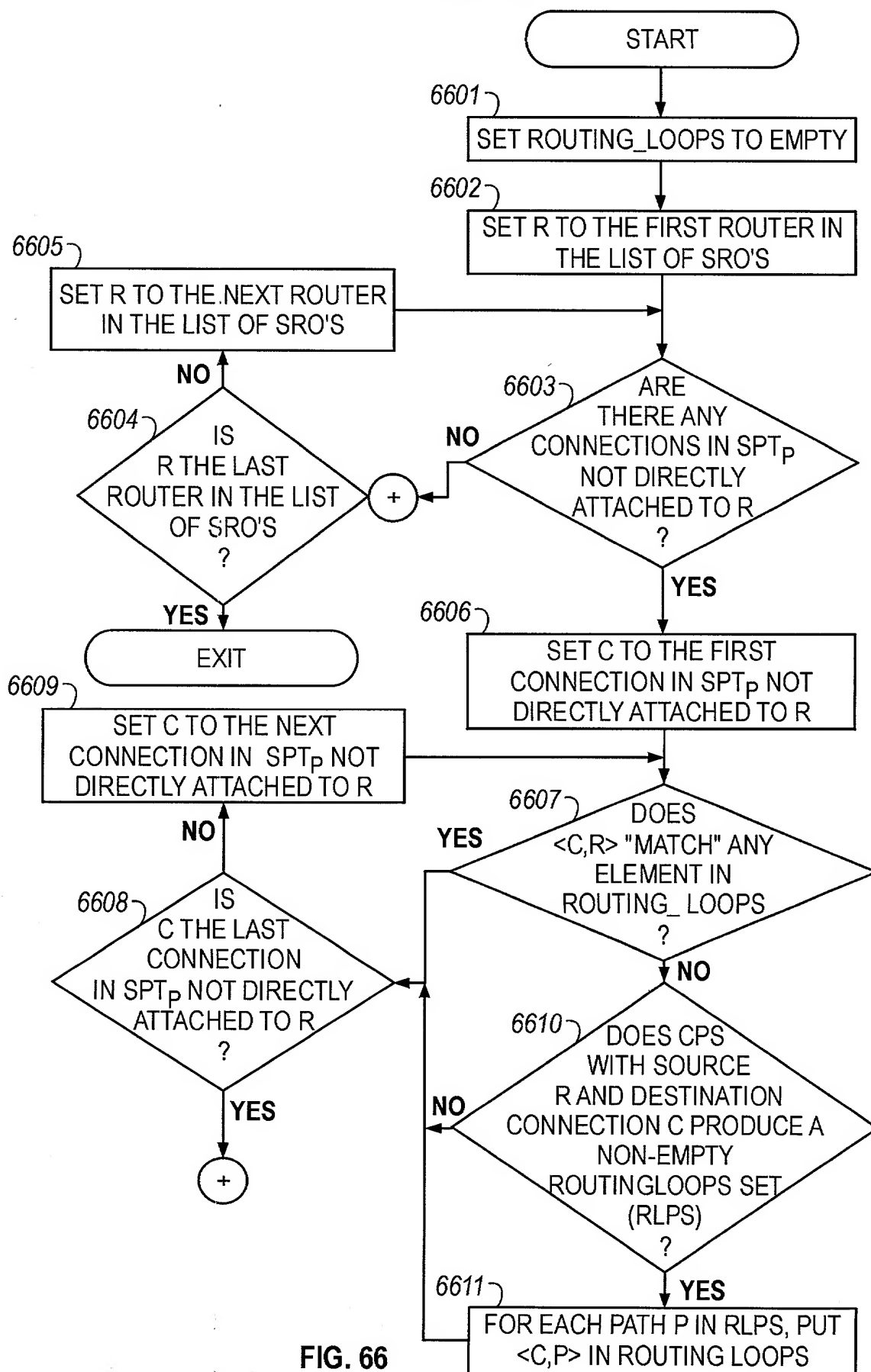


FIG. 66

1004485 600 50842001

104/104

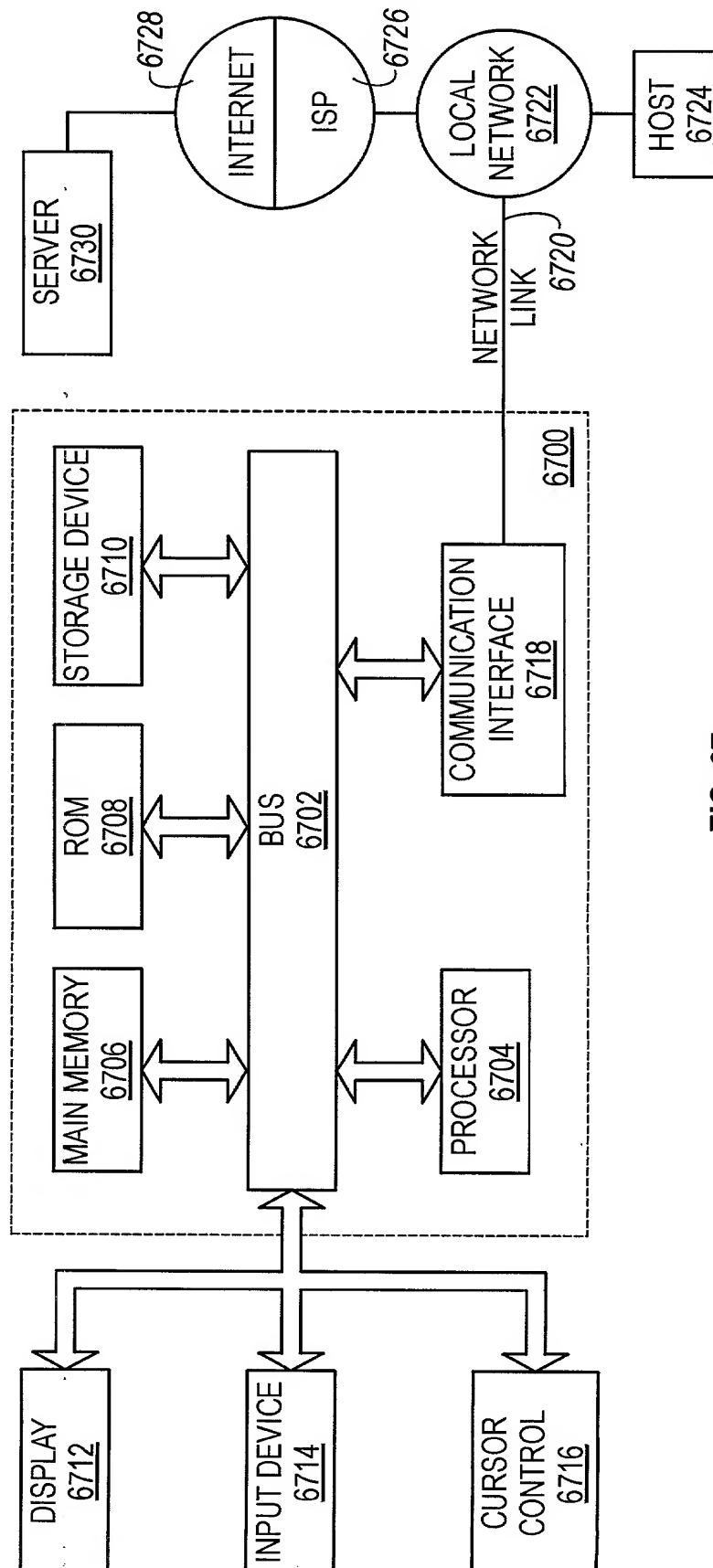


FIG. 67

2025032400T